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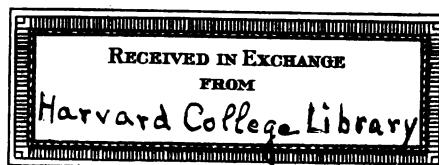
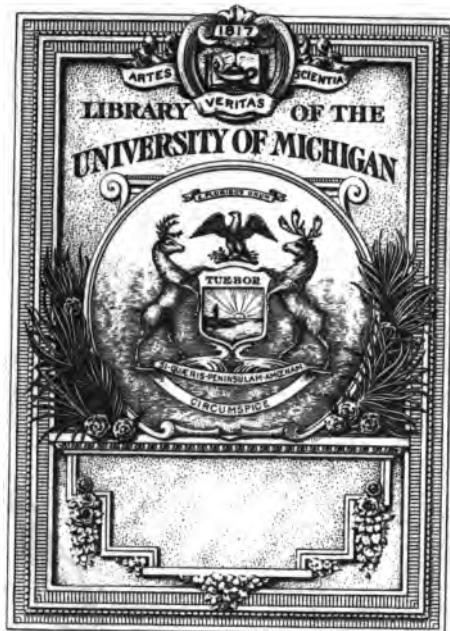
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ELEVENTH ANNUAL REPORT  
OF THE  
METROPOLITAN SEWERAGE  
COMMISSION

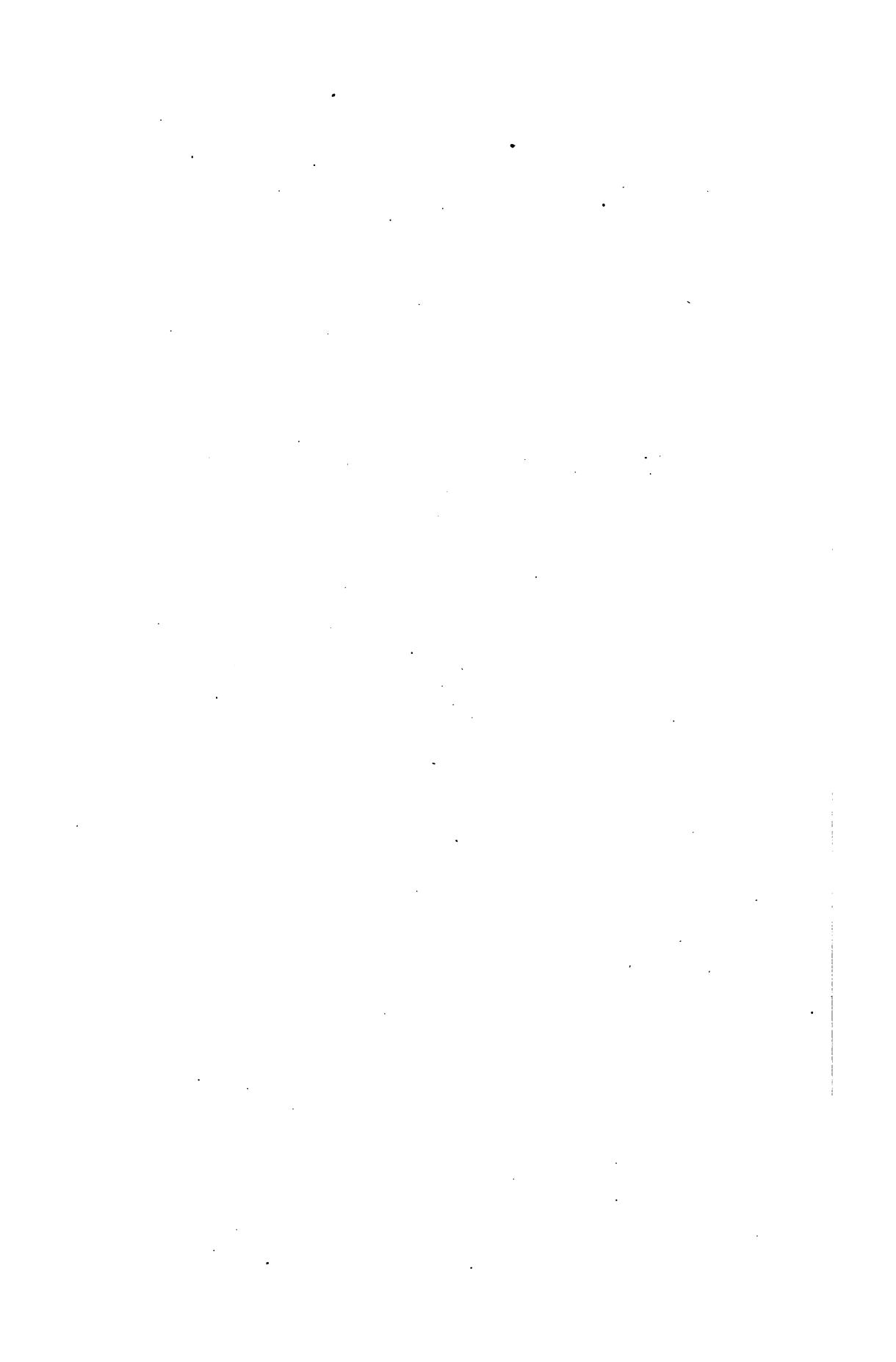
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## ELEVENTH ANNUAL REPORT

OF THE

## BOARD

OF

*Massachusetts*

## METROPOLITAN SEWERAGE

## COMMISSIONERS,

*Compliments of . . .*

William M. Brown, Jr.,

*Chief Engineer and Superintendent.*

BOSTON:

WRIGHT & POTTER PRINTING CO., STATE PRINTERS,  
18 POST OFFICE SQUARE.

1900.



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## Commonwealth of Massachusetts.

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*To the Honorable the Senate and the House of Representatives in General Court assembled.*

The Board of Metropolitan Sewerage Commissioners, created by chapter 439, Acts of 1889, respectfully submits its report for the year ending Sept. 30, 1899, being its

### ELEVENTH ANNUAL REPORT.

The work of the Board during the last year has been largely that of maintaining the three large systems (North Metropolitan, Charles River, Neponset valley) reported as nearing completion in the last report, and in making detailed studies, surveys and estimates for a high-level gravity sewer for the relief of the Charles and Neponset River valleys.

The Lexington branch, unfinished at the date of the last report, has since been completed, so that at this date (Sept. 30, 1899) the entire North Metropolitan system, with all its branches, — Wakefield, Stoneham, Lexington and Everett, — is constructed and in operation.

Contracts for building additions to the pumping plants at the four pumping stations (Deer Island, East Boston, Charlestown and North Somerville), for which \$155,000 was appropriated by chapter 424, Acts of 1898, have been executed and partial payments made.

The cost of the North Metropolitan system, with all its branches, to date is \$5,262,397.68. The total cost of the Charles River system to date is \$789,134.27, and that of the Neponset River valley system to date is \$840,444.73.

There remain unpaid upon the North Metropolitan system final payments on pumping plants, as well as sums due on all three systems for land damages and cases in court which are subject to negotiations, the exact amount of which it is impossible to state. (See Appendix, Tables K. and M.)

On account of the increased sewerage area of the Charles and Neponset valley districts making larger demands upon the capacity of the Boston main drainage works and out-fall at Moon Island, and on account of the large annual rentals demanded by the city of Boston, for discharging the sewage from the Charles and Neponset valley systems into the Boston main drainage, the Legislature, upon the recommendation of this Board, made an appropriation, under chapter 4, Resolves of 1898, of \$30,000, "authorizing and directing this Board to consider and report upon a high-level sewer for the relief of the Charles and Neponset River valleys."

At the date of our last report (Sept. 30, 1898), careful surveys, investigations and studies were being prepared for such relief. The Board engaged Mr. Joseph P. Davis of New York as consulting engineer, who examined and approved the work of our chief engineer; and on Feb. 28, 1899, the special report on the subject was transmitted to the Legislature.

This report treats of the subject at great length, containing numerous tables and maps, showing the result of extended studies and experiments.

There was also included, as directed, a draft of a bill for carrying out the recommendations of this Board.

On May 27, 1899, an act was signed by the Governor, providing for the construction of said high-level sewer, and appropriating therefor the sum of \$4,600,000. This act was passed substantially as recommended in the report, and is as follows:—

[CHAPTER 424.]

AN ACT TO PROVIDE FOR THE CONSTRUCTION OF A HIGH-LEVEL GRAVITY SEWER FOR THE RELIEF OF THE CHARLES AND NEPONSET RIVER VALLEYS.

*Be it enacted, etc., as follows:*

SECTION 1. The board of metropolitan sewerage commissioners shall, for the purpose of constructing, maintaining and operating a system of sewage disposal for the south metropolitan system as hereinafter defined, construct, maintain and operate such mains, sewers and other works as may be necessary, in substantial accordance with plans outlined in a special report of said board to the

general court of eighteen hundred and ninety-nine : *provided, however,* that no part of said proposed outlet, or sewerage system, between Hyde Park and the outlet, shall be constructed before the year nineteen hundred, and until plans for said outlet shall be further considered by said board, and adopted and approved by the state board of health.

SECTION 2. The south metropolitan system shall include the present Charles river valley metropolitan sewerage district, comprising a part of Boston, the cities of Newton and Waltham, and the towns of Watertown and Brookline ; the present Neponset valley metropolitan sewerage district, comprising a part of Boston and the towns of Dedham, Hyde Park and Milton ; also Quincy and such portion of Dorchester, Roxbury and West Roxbury as are not included in the present metropolitan sewerage areas, and as are so situated as to be drained into the proposed high-level sewer substantially as outlined on maps contained in the special report of the metropolitan sewerage commissioners to the general court of eighteen hundred and ninety-nine. Nothing herein shall be construed to vest any rights which cannot be extended to cities and towns or parts thereof other than those herein named, upon such terms and conditions as may hereafter be imposed by legislative enactment.

SECTION 3. Said board, acting on behalf of the Commonwealth, may take by purchase or otherwise any lands, water courses, rights of way or easements, and may take by purchase or otherwise or enter and use existing sewers or parts of sewers necessary for carrying out, under the provisions of this act, the recommendations contained in the said report. When any lands, water courses, rights of way or easements, or any sewers or parts of sewers are so taken or entered and used in any manner other than by purchase or agreement, said board shall, within thirty days of said taking or entering and using, cause to be recorded in the registry of deeds for the county or district in which such lands, water courses, rights of way or easements, or sewers or parts of sewers lie, a description thereof sufficiently accurate for identification, with a statement of the purpose for which the same are taken or entered and used, which description shall be signed by a majority of said board ; and the fee of the lands, or if an easement or other estate less than the fee therein be specified and described in the deed of purchase or in the description and statement of taking to be recorded as aforesaid, then such easement or estate therein as is so specified and described, and the water courses, rights of way or easements, or sewers or parts of sewers so taken or purchased shall vest in the Commonwealth, which shall pay, in the manner

hereinafter described, all damages which may be sustained by any person or corporation by reason of such taking or entering as aforesaid. Such damages are to be agreed upon by said board and the person or corporation injured; and if the parties cannot agree a jury in the superior court of the county in which the property taken or damaged is situated may be had to determine the same, in the same manner as a jury is had and damages are determined in the case of persons dissatisfied with the estimate of damages sustained by the laying out of ways in the city of Boston: *provided, however,* that no suit for such damages shall be brought after the expiration of two years from the date of the recording of the taking or entering as herein required.

SECTION 4. Said board may, for the purposes aforesaid, carry any sewer made by it under or over any water course, or any street, turnpike road, railroad, highway or other way in such manner as not unnecessarily to obstruct or impede travel thereon; and may enter upon and dig up any such road, street or way for the purpose of laying sewers beneath the surface thereof and of maintaining and repairing the same; and in general may do any other acts and things necessary or convenient and proper for the purposes of this act. In entering upon and digging up any such road, street or way of public travel said board shall be subject to such reasonable regulations as may be made by the mayor and aldermen or selectmen of the cities and towns, respectively, wherein such work shall be performed.

SECTION 5. Whenever said board shall dig up any road, street or way, as aforesaid, it shall so far as practicable restore the same to as good order and condition as the same was in before such digging began; and the Commonwealth shall at all times indemnify and save harmless the several cities and towns within which such roads, streets or ways are situated, against all damages which may be recovered against them respectively, and shall reimburse them for all expenses which they may incur by reason of any defect or want of repair in any road, street or way, caused by the construction of any of said sewers, or by the maintaining or repairing of the same: *provided*, that said board has due and reasonable notice of all claims for such damages or injury, and opportunity to make a legal defence thereto.

SECTION 6. Said board may also change the direction of any water course, and may with the consent of the mayor and aldermen of cities or selectmen of towns, widen or change the location or grade of any highway, townway, public street or other way of travel crossed by any sewers constructed under the provisions of this act, or in which such sewers may be located.

SECTION 7. Said board shall at all times keep accurate and complete accounts of its receipts, expenditures, assets and liabilities, and shall include an abstract of the same in its annual report to the general court.

SECTION 8. Any city or town, within the limits of which any main sewer shall have been constructed under the provisions of this act, shall connect its local sewers with such main sewer, except as hereinafter provided, subject to the direction and control of said board, and any person, firm or corporation may, subject to the direction, control and regulation, from time to time, of said board, and subject to such terms, conditions and regulations as each city or town may prescribe, connect private drains with such main sewer: *provided*, that the said board shall, without expense to the city of Quincy, make all connections and take and construct such intercepting sewers as may be necessary to enable the city of Quincy to drain by gravity its territory into said metropolitan sewer. The present pumping station and force mains of the city of Quincy shall be taken and paid for by said board of metropolitan sewerage commissioners, and said board shall build and operate such new force main or mains and pumping stations as may be necessary to enable the city of Quincy to drain its sewerage systems into said metropolitan sewer. The sewerage systems of all drainage areas not now drained by the south metropolitan system, which are constructed after the passage of this act, shall be constructed in accordance with the so-called separate system of sewerage.

SECTION 9. Any person or persons who shall wantonly or maliciously destroy or injure any sewer or other property held or used by said board by the authority and for the purposes of this act, shall forfeit and pay to the Commonwealth three times the amount of the damages that shall be assessed therefor, to be recovered by any proper action. And every such person or persons may, on complaint, or indictment, and conviction of any of the wanton or malicious acts aforesaid, be punished by a fine not exceeding one thousand dollars, and by imprisonment not exceeding one year.

SECTION 10. Said board may from time to time, and at public or private sale as they may deem best, dispose of any property, real or personal, no longer needed for the construction, maintenance or operation of the sewers authorized by this act: *provided*, that such sale shall not impair the maintenance and operation of said sewers.

SECTION 11. Real estate so sold may be conveyed, subject to such easements, reservations and restrictions as said board may deem necessary to secure the maintenance, renewal and operation

of said sewers, by deed duly executed by said commissioners on behalf of the Commonwealth, with or without warranty.

SECTION 12. The net proceeds of any such sales, after deducting all necessary expenses incurred thereby, shall be paid into the treasury of the Commonwealth and shall be credited to and form a part of the fund to be used in the construction or maintenance of said sewers.

SECTION 13. Any money which may be received by the treasurer and receiver general of the Commonwealth from checks deposited with said board by bidders for work, and by said board declared forfeited, and any sums received by said treasurer and receiver general for breach of any contract made with said board, shall be applied to the payment of interest upon the loan made under authority of this act.

SECTION 14. To meet the expenses incurred under the provisions of this act for the construction of the sewerage works recommended the treasurer and receiver general shall, with the approval of the governor and council, issue from time to time scrip or certificates of debt, in the name and behalf of the Commonwealth and under its seal, to an amount not exceeding four million six hundred thousand dollars, for a term not exceeding forty years from the date thereof. Said scrip or certificates of debt shall be issued as registered bonds or with interest coupons attached, and shall bear interest not exceeding four per cent per annum, payable on the first days of March and September in each year. Said interest and scrip or certificates shall be made payable, and when due shall be paid, in gold coin or its equivalent. Said scrip or certificates of debt shall be designated on the face thereof as the Metropolitan Sewerage Loan, shall be countersigned by the governor, and shall be deemed a pledge of the faith and credit of the Commonwealth, redeemable at the times specified therein in gold coin or its equivalent, and shall be sold and disposed of at public auction or in such other mode and at such times and prices and in such amounts and at such rates of interest, not exceeding four per cent per annum, as the treasurer and receiver general, with the approval of the governor and council, shall deem for the best interests of the Commonwealth. Any scrip or certificates of debt issued under the provisions of this act shall be construed as an addition to and shall become a part of the loan authorized by chapter four hundred and thirty-nine of the acts of the year eighteen hundred and eighty-nine; and the sinking fund established under the provisions of said chapter shall be a sinking fund for the extinguishment of the debt authorized by this act. The treasurer and receiver general shall, on issuing any of said scrip or certificates of debt, apportion

thereto from year to year an amount sufficient with its accumulations to extinguish the debt at maturity; but any such apportionment or assessment shall be at the rate of one eightieth part of the whole amount in each of the first ten years, one sixtieth part in each of the second ten years, one thirtieth part in each of the third ten years, and the remainder equally divided in the next ten years. Any premium realized on the sale of said scrip or said certificates of debt shall be applied to the payment of the interest on said loan as it accrues.

SECTION 15. The interest and sinking fund requirements and the cost of maintenance and operation of the Charles river system, incurred under the provisions of chapter four hundred and thirty-nine of the acts of the year eighteen hundred and eighty-nine, and the interest and sinking fund requirements and the cost of maintenance and operation of the Neponset river system, incurred under the provisions of chapter four hundred and six of the acts of the year eighteen hundred and ninety-five, and of acts in amendment thereof, shall be assessed upon the cities and towns of the south metropolitan district as hereinafter provided.

SECTION 16. The supreme judicial court sitting in equity shall, on the application of said board after notice to each of the cities and towns hereinbefore named, appoint three commissioners, who shall not be residents of any of the cities or towns mentioned in this act, who shall, after due notice and hearing and in such manner as they shall deem just and equitable, determine the proportion in which each of the cities and towns hereinbefore named shall annually pay money into the treasury of the Commonwealth for the term of five years next after the year of the first issue of said scrip or certificates, to meet the interest and sinking fund requirements for each of said years, as estimated by said treasurer, and to meet the cost of maintenance and operation of said system for each of said years, as estimated by the said board and certified to said treasurer, and any deficiency in the amount previously paid in, as found by said treasurer, and shall return their award into said court; and when said award shall have been accepted by said court the same shall be a final and conclusive adjudication of all matters herein referred to said commissioners, and shall be binding on all parties.

SECTION 17. Before the expiration of said term of five years and every five years thereafter other commissioners, who shall not be residents of any of the cities or towns mentioned in this act, shall be appointed as aforesaid, who shall, in such manner as they deem just and equitable, determine the proportion in which each of said cities and towns in each of said systems shall annually pay

money into the treasury of the Commonwealth as aforesaid for the next succeeding term of five years, and shall return their award into said court; and when said award shall have been accepted by said court the same shall be a final and conclusive adjudication of all matters herein referred to said commissioners, and shall be binding on all parties.

SECTION 18. The amount of money required each year from each such city and town to meet the interest, sinking fund requirements and cost aforesaid for that system in which it is included for each year, and the deficiency, if any, shall be estimated by said treasurer, in accordance with the proportion determined as aforesaid, and shall be included in and made a part of the sum charged to such city or town, and shall be assessed upon it in the apportionment and assessment of its annual state tax, and said treasurer shall in each year notify each such city and town of the amount of such assessment, which amount shall be paid by the city or town into the treasury of the Commonwealth at the time required for the payment and as a part of its state tax.

SECTION 19. The clerk of the board of metropolitan sewerage commissioners, or such other person as said board may designate, may have advanced to him from the money in the treasury of the Commonwealth received from the loan hereinbefore authorized, such sums, not exceeding ten thousand dollars at any time, as the auditor may certify to be necessary to enable said board to make direct payments upon its pay rolls and other accounts. The person so designated by said board shall give bond with sufficient sureties, to be approved by the auditor of the Commonwealth, in the sum of ten thousand dollars.

SECTION 20. As soon as may be after expending such advance, and in any case within thirty days from the receipt thereof, the officer who has received money of the Commonwealth under the provisions of the preceding section shall file with the said auditor a statement in detail of the sums expended subsequent to the previous accounting, approved by said board, and, where it is practicable to obtain them, receipts or other like vouchers of the persons to whom the payments have been made.

SECTION 21. The supreme judicial court shall have jurisdiction in equity to enforce the provisions of this act, and shall determine the compensation of all commissioners appointed by said court under the provisions hereof.

SECTION 22. The expense incurred by the board of metropolitan sewerage commissioners under the provisions of chapter four of the resolves of the year eighteen hundred and ninety-eight shall be charged to the fund to be used in the construction and maintenance

of said sewers, and the amounts paid by the several cities and towns named in said resolve shall be repaid to said cities and towns, in the settlement of their proportionate part of the cost of the construction and maintenance of said sewers.

SECTION 23. This act shall take effect upon its passage. [Approved May 27, 1899.]

This takes into the sewerage system the city of Quincy and portions of Dorchester, Roxbury and West Roxbury not heretofore included in metropolitan sewerage areas. These additions, together with the districts embraced by Waltham, Watertown, Newton, Brighton, Brookline, Dedham, Hyde Park and Milton, are to be known hereafter as the South Metropolitan system. Sewage from the Charles River and Neponset valley systems, which is now discharged at Moon Island through the city of Boston's sewer, will be taken to the independent outlet of the South Metropolitan system, about three-fourths of a mile off Nut Island, at a depth of twenty-six feet at low tide.

The high-level sewer will be about sixteen miles long, the cost of construction, necessary pumping station for the Charles River system and of the pumping plant to be bought of the city of Quincy,—including land damages and entire cost of high-level system,—being estimated at \$4,600,000. Of this amount, bonds amounting to \$1,000,000 have been sold by the Treasurer and Receiver-General, approved by the Governor's Council, as follows:—

COMMONWEALTH OF MASSACHUSETTS,  
COUNCIL CHAMBER, BOSTON, June 21, 1899.

*Ordered*, That the public sale made on the fifteenth day of June, eighteen hundred and ninety-nine, by the Treasurer and Receiver-General of the Commonwealth of Massachusetts to Messrs. Kuhn-Loeb & Co., of New York, of one million dollars (\$1,000,000) in registered bonds of the Metropolitan Sewerage Loan, at the price of one hundred and sixty-four one-hundredths (100.64), or on the basis of two and ninety-seven one-hundredths (2.97), substantially, with the accrued interest, from the first day of March, eighteen hundred and ninety-nine, at the rate of three per cent. (3 %) per annum, be and the same hereby is approved.

To date the total expenditures on the high-level sewer are as follows:—

Preliminary investigation for high-level report, . . . . .	\$25,677 96
High-level construction account, . . . . .	18,930 50
	<hr/>
	\$44,608 46

Following is a list of the several appropriations made by the Legislature for the work of the Metropolitan Sewerage Commission, with the balances available to date:—

*North Metropolitan and Charles River Loan.*

1889, chapter 439, . . . . .	\$5,000,000 00
1894, chapter 307, . . . . .	500,000 00
1895, chapter 294, . . . . .	300,000 00
1896, chapter 414, . . . . .	30,000 00
1897, chapter 88, . . . . .	5,000 00
1897, chapter 436, . . . . .	10,000 00
1897, chapter 520, . . . . .	70,000 00
1898, chapter 215, . . . . .	60,000 00
1898, chapter 424, . . . . .	<hr/> 155,000 00
Total appropriation, . . . . .	\$6,130,000 00
Additions, . . . . .	9,291 98
Available, . . . . .	<hr/> \$6,139,291 98
Expended to date, . . . . .	6,051,531 95
Balance Sept. 30, 1899, . . . . .	<hr/> \$87,760 03

*Neponset Valley Loan.*

1895, chapter 406, . . . . .	\$500,000 00
1897, chapter 83, . . . . .	300,000 00
1888, chapter 180, . . . . .	35,000 00
1899, chapter 241, . . . . .	<hr/> 25,000 00
Total appropriation, . . . . .	\$860,000 00
Additions, . . . . .	109 50
Available, . . . . .	<hr/> \$860,109 50
Expended to date, . . . . .	840,444 73
Balance Sept. 30, 1899, . . . . .	<hr/> \$19,664 77

*High-level Sewer Loan.*

1899, chapter 424, . . . . .	\$4,600,000 00
Expended to date, . . . . .	44,608 46
Balance Sept. 30, 1899, . . . . .	<hr/> \$4,555,391 54

Details of the work for the year follow.

### NORTH METROPOLITAN SYSTEM.

The following settlements for land taken upon this system have been made during the year:—

By deed dated June 13, 1899, recorded with Middlesex South District Deeds, book 2777, page 171, Henry C. Little and Clarence B. Little, trustees under the will of Guy T. Little, by virtue of a decree of the probate court for the county of Suffolk, released to the Commonwealth rights, privileges and easements in land in Cambridge, included within a taking made by the Board, in behalf of said Commonwealth, dated July 19, 1893, and recorded with Middlesex South District Deeds, book 2210, page 481. On the same date Clarence B. Little, by deed recorded with Middlesex South District Deeds, book 2777, page 172, released to the Commonwealth rights, privileges and easements in land in Cambridge, included within the above mentioned taking.

Robert MacDonald, the owner of property on Massachusetts Avenue, Arlington, claimed that, owing to the construction of the metropolitan sewer through Massachusetts Avenue in said Arlington, a supply of 4,000 gallons of water per day had been reduced to about 500 gallons per day. At the expense of the Board the well was dug deeper; but, as the water failed to appear in the usual quantity, the claim was finally adjusted by the Commonwealth's paying said MacDonald the sum of \$100 in full settlement for said damage, and also agreeing to repair the curbing and restore the banking around said well to as good condition as it previously existed.

A settlement was effected for personal damages sustained by Mrs. Susan J. Madden of Winchester, occasioned by falling into a sewer trench in Winchester, April 26, 1899. After a hearing upon the subject and after due consideration of the matter the Board offered \$200 in full settlement for said damages, and the same was later accepted and accordingly paid.

Damages to the amount of \$300 to real estate in Somerville belonging to Lucretia T. Carr, *et al.*, included within taking made by this Board Jan. 7, 1893, and recorded with Middlesex South District Deeds, libro 2169, folio 457, was paid by agreement, December, 1898.

The case of Edward L. Fitzgerald and Louisa A., his wife, *v.* city of Chelsea, for personal injuries, received March 24, 1895, through the removal of a fence on Section 11, on Eastern Avenue, Chelsea, was considered Nov. 12, 1898. It was stated that the plaintiffs would settle for \$1,500 as a compromise. Geo. M. Stearns, counsel for the city of Chelsea, was present in the interest of said city. Charles Linehan, contractor upon said section, appeared with his counsel, Thos. H. Buttiner, Esq. As this was a case in which, according to the terms of the contract, the contractor is liable, and as the said Charles Linehan failed to make good the amount to the Commonwealth, the clerk was directed to notify the Attorney-General to bring suit against said contractor to recover the amount of judgment, cost and expenses in the said case. At the present writing the case has not been settled. The Board had previously agreed to make good to the city of Chelsea the amount of judgment, cost and expenses in this case, which amount (\$2,171.90) was accordingly paid.

#### EXPENDITURES.

The expenditures upon this system (North Metropolitan), including all payments on account of contracts during the year ending Sept. 30, 1899, amount to \$83,385.64. This, with the amount previously reported, \$5,008,363.38, makes the total expenditures \$5,091,749.02 on this system proper, to date.

#### LEXINGTON BRANCH.

The work of construction on this branch (provided for by chapter 520, Acts of 1897) was begun early in 1898, and at the meeting held Jan. 21, 1899, the chief engineer presented the certificate of completion, the same being accepted by the Board. On Dec. 31, 1898, the Commonwealth paid the town of Arlington the sum of \$2,400.13 for the sewers of said town taken Sept. 3, 1898, in connection with the con-

struction of this branch, this amount being in full settlement for said sewers, which, with the amount previously paid (\$40,000), makes as the total amount paid the town \$42,-400.13. In accordance with chapter 520, Acts of 1897, the sum of \$2,494.88 was determined by the Board as the amount to be paid by said town for this year (1899), as its fair share of the interest and sinking fund requirements of the North Metropolitan system.

The expenditures upon the Lexington branch have been to date \$68,585.15.

#### WAKEFIELD BRANCH.

With the completion of the Wakefield branch (provided for under chapter 414, Acts of 1896) the question of the connection of the town of Wakefield with the metropolitan system of sewerage by means of said branch was considered by the Board at a hearing given July 8, 1899. The said hearing was attended by members of the boards of the sewer committee and others of said town, as follows: Messrs. R. H. Stout, selectman and member of the sewer committee; Charles A. Dean, representative from the town of Melrose; N. E. Cutler, member of the sewer committee; George S. Rice and George E. Evans, consulting engineers; together with John Crosby, a representative of the citizens of said town. The question was discussed at great length, and all information obtainable regarding data, etc., was given by the Board. At the present time no further action has been taken.

#### EVERETT BRANCH.

In accordance with chapter 215, Acts of 1898, which required the taking by the Board of a portion of the local sewage system of the city of Malden, the Board, Oct. 8, 1898, executed a deed of taking of land in said city, as shown on four plans, entitled, "Commonwealth of Massachusetts. Plan of Land in Malden, with intercepting sewer therein." Said taking lies wholly within the public streets of said city, as follows: beginning at a point in Middlesex Street at its junction with Charles Street, running in a westerly line through Charles Street to Main Street; thence southerly through Main Street, under the tracks of the

location of the Saugus branch of the Boston & Maine Railroad to Eastern Avenue ; thence north-easterly through that portion of Eastern Avenue lying between the westerly line of Main Street and the easterly line of Bryant Street, produced, and including all of said Eastern Avenue ; also including all that part of Ferry Street formed by its junction with said Eastern Avenue ; also all that part of Phillips Street between the northerly and southerly lines of Eastern Avenue, produced ; also all that part of Franklin Street between the northerly and southerly lines of said Eastern Avenue, produced ; also all that portion of Bryant Street extending from the northerly line of said Eastern Avenue, produced, to the southerly line of Cross Street, produced ; including all that part of Cross Street formed by its junction with said Bryant Street and between the easterly and westerly lines of said Bryant Street, produced. Said taking is recorded with Middlesex South District Deeds, libro 2693, folio 123.

For said sewers the Commonwealth paid the city of Malden the sum of \$50,096.51.

The amount expended upon the Everett branch has been to date \$54,877.12.

#### CONTRACTS.

In our last report (tenth annual, for the year ending Sept. 30, 1898) it was stated that bids had been opened for the additional pumping plants at the North Somerville, Charlestown, East Boston and Deer Island pumping stations, and also that the contract for the North Somerville station had been awarded to the George F. Blake Manufacturing Company of New York, the lowest bidders, for the sum of \$7,500.

On Oct. 1, 1898, said contracts were executed with the George F. Blake Manufacturing Company of New York, for the building of the proposed additions to the pumping plant of the Metropolitan sewerage system, located at the Alewife Brook pumping station, on the easterly side of the Alewife Brook in North Somerville. The bond for the same (amount fixed by the Board at \$3,000) was furnished, with the American Surety Company of New York as surety.

On the same date (Oct. 1, 1898) the bid of the Edward

P. Allis Company of Milwaukee, Wis., was accepted for building the proposed additions to the pumping plants at the Deer Island, Charlestown and East Boston pumping stations; and on Oct. 15, 1898, the contracts were executed for building said pumping plants, the same to be located on Deer Island, Boston harbor; on the southerly side of Chelsea Creek in East Boston, east of and adjacent to the Grand Junction Railroad location; and at the northerly end of the Malden bridge over the Mystic River, Charlestown. The amount of bids for the same were: Deer Island, \$27,200; Charlestown, \$25,800; and East Boston, \$25,600. The sum of \$30,000 was fixed as the amount of the bond for the three plants; such bond was furnished with the National Surety Company of New York as surety.

The plant at North Somerville is the only one yet in position, and that has not as yet been accepted by the Board.

#### OTHER CONTRACTS.

On Oct. 8, 1898, bids were opened for supplying the Deer Island, Charlestown and East Boston pumping stations with a supply of coal; and the bid of Henry T. Woods, the lowest bidder, was accepted for furnishing coal for the three stations.

On March 25, 1899, of the bids received for furnishing coal for the Charlestown and East Boston pumping stations, the bid of the Metropolitan Coal Company was accepted by the Board.

From the number of bids received June 3, 1899, for furnishing a yearly supply of coal for all four of the pumping stations from July, 1899, to July, 1900, the bid of the Metropolitan Coal Company was accepted by the Board, said company being the lowest bidders.

Of the bids that were received and opened March 11, 1899, for furnishing lumber, sand, broken stone, cement, gravel, bricks and cut stone for the Deer Island and East Boston pumping stations, required in the construction of the foundations for the new pumping plants, the following were accepted: Waldo Bros., furnishing cement for the Deer Island and East Boston stations, and also sand for the Deer Island pumping station; that of P. O'Riorden, for furnishing gravel

for the East Boston station; that of H. & D. Burnett, for furnishing sand for the East Boston station; that of T. H. Buck & Co., for furnishing lumber for the East Boston station; that of Walter S. Lyons, for furnishing cut stone for both the Deer Island and East Boston stations; that of Andrew F. Leatherbee, for furnishing lumber for the Deer Island station; that of Parry Bros., for furnishing bricks both for the East Boston and Deer Island stations; and that of Christian Peterson, for furnishing screened gravel for the Deer Island pumping station.

For tables of bids, see Appendix.

On July 8, 1899, an agreement was made between this Board and the Massachusetts Pipe Line Gas Company, by its president, H. M. Whitney, for the right to carry and conduct under the following described lands, and therein to construct, operate and maintain a gas pipe siphon and shaft, to wit, a strip of land twelve feet wide running northerly forty feet along the easterly side of Alford Street, in the city of Boston, from the south-west corner of the Charlestown pumping station lot belonging to the Commonwealth of Massachusetts, under taking made by this Board, dated July 13, 1895, said strip of land being more particularly shown on blue print submitted by the Massachusetts Pipe Line Gas Company, entitled "Plan and profile showing proposed location of siphon of the Massachusetts Pipe Line Gas Company across Mystic River at Malden Bridge, Boston, Mass."

#### CLAIMS OF CONTRACTORS.

At a meeting of the Board, held Dec. 3, 1898, John Lowell, Esq., attorney for the John Booth Company, contractors upon Section 50, Wakefield branch, discussed the claim presented by the said company for compensation for extra rock excavation in the construction of said section. After giving the matter full consideration, the Board —

*Voted*, That said claim be disallowed.

On March 25, 1899, the Board was notified from the office of the Attorney-General that said John Booth Company had brought suit against this Board, and the case is still on the list.

At a meeting of the Board, June 3, 1899, Long & Little, contractors upon Section 53, Lexington branch, presented their claim for extra compensation on account of excessive rock excavation on said section.

On July 1, 1899, the chief engineer presented his report upon said claim, and after discussing the matter, it was —

*Voted*, That the clerk notify the contractors, Long & Little, that after full consideration the Board sees no reason why any allowance should be made said contractors on account of alleged excess of rock excavation on Section 53, Lexington branch.

#### CONNECTIONS AUTHORIZED DURING THE YEAR ON THE NORTH METROPOLITAN SYSTEM.

For the year ending Sept. 30, 1899, 241 connections were authorized with the metropolitan sewer upon this system. These connections are distributed as follows: Arlington, 65 ; Boston (Charlestown district), 4 ; Boston (East Boston), 1 ; Cambridge, 1 ; Everett, 1 ; Malden, 97 ; Medford, 1 ; Melrose, 68 ; Somerville, 1 ; Stoneham, 1 ; and Winthrop, 1.

A tabulated list of all connections that have been made and authorized upon this system will be found in Table L of the Appendix.

### NEPONSET VALLEY SYSTEM.

The following settlements for land taken upon this system have been made during the year : —

On Oct. 1, 1898, Charles F. Allen, Herbert N. Bates and George E. Whiting, as trustees of the Hyde Park Associates, quit-claimed to the Commonwealth "rights, privileges and easements" in land in Hyde Park, included within a taking dated June 13, 1896, and recorded with Norfolk Deeds, book 764, page 5. Said deed is recorded with Norfolk Deeds, libro 840, folio 632. On the same date, by deed recorded with Norfolk Deeds, libro 840, folio 634, Charles F. Allen and G. Fred Gridley, the surviving trustees of the Hyde Park Associates, quit-claimed to the Commonwealth similar rights in land in said Hyde Park, included within the same taking (dated June 13, 1896).

On Nov. 21, 1898, Eliza H. Curtis of Melrose, by deed recorded with Suffolk Registry, libro 2621, page 452, quit-claimed to the Commonwealth "rights, privileges and easements" in land in that part of Boston called West Roxbury, included within a taking made June 5, 1897, and recorded with Suffolk Deeds, book 2448, page 6.

The Caledonian Club of the city of Boston, by Robert Earle May, its treasurer, duly authorized thereto by vote of said club, in a deed dated Nov. 1, 1898, recorded with Suffolk Deeds, libro 2621, page 449, quit-claimed to the Commonwealth "rights, privileges and easements" in and to three certain parcels of land in that part of Boston called West Roxbury, included within a taking dated June 5, 1897, and recorded with Suffolk Deeds, book 2448, page 6. The same deed also releases the said Commonwealth from all damages claimed by the grantor for loss of income and rents and damages done to its well supply.

Henry M. Higgins of Hyde Park, on the third day of February, 1899, by deed recorded with Norfolk Deeds, libro 840, folio 631, released to the Commonwealth an easement

in land in Hyde Park, included within a taking made April 25, 1896, and recorded with Norfolk Deeds, book 759, page 601.

Wm. A. Mowry, in his own right and as executor under the will of Caroline E. Mowry, deceased, by deed dated March 18, 1899, recorded with Norfolk Deeds, libro 840, folio 633, released to the Commonwealth certain rights in land in Hyde Park, under taking dated April 25, 1896, and recorded with Norfolk Deeds, book 759, page 601.

By a release dated April 21, 1899, recorded with Suffolk Deeds, libro 2621, page 442, John H. Nay and Mary E. Nay, his wife, quit-claim to the Commonwealth certain rights in a piece of land in that part of Boston called West Roxbury, included within a taking dated June 5, 1897, recorded with Suffolk Deeds, book 2448, page 6.

A quit-claim deed from Ella E. Goss of Hyde Park, dated April 21, 1899, recorded with Norfolk Deeds, libro 849, folio 361, releases to the Commonwealth, "rights, privileges and easements" in land in said Hyde Park included within the taking made by this Board April 25, 1896, recorded with Norfolk Deeds, book 759, page 601.

Damages to the amount of \$425, for a parcel of land in Hyde Park belonging to Margery A. Hickey, included within the taking made April 25, 1896, and recorded with Norfolk Deeds, was paid by the Commonwealth upon agreement.

The city of Boston, in January, 1899, brought two actions against the Metropolitan Sewerage Commission: one an action of tort against the commissioners; the second a petition under the statute on account of a taking (dated June 5, 1897) made in the land of, and damage to, the Boston Parental School building, caused by the construction of the metropolitan sewer through said taking. The suit is now pending in the superior court.

#### CLAIMS OF CONTRACTORS.

Early in March, 1899, Charles F. Kittredge, the counsel for the National Contracting Company of New York, contractors for the construction of sections 26 and 27, Neponset valley system, appeared before the Board in regard to his clients' claim for extraordinary and difficult obstacles sus-

tained by said company in the construction of said sections. Said company claimed a loss of \$52,971.67. Extended hearings were held on this claim, May 20 and 27, and much evidence was taken by the Board. After careful consideration it was —

*Voted*, To pay the National Contracting Company twelve thousand five hundred dollars (\$12,500) in full settlement of all claims for damage of whatever nature on sections 26 and 27, Neponset valley system.

After further considerable urging on the part of the attorney of said company to increase the award, it was finally accepted. On June 15, 1899, the said company, by its attorney, signed a release to the Commonwealth in settlement of all claims for compensation, costs and expenses for work performed, materials and labor furnished, and sums paid and expenses incurred, in addition to the amounts paid under the terms of said contracts.

Messrs. Mathers & Sullivan, the contractors upon sections 21 and 22, Neponset valley system, filed a claim for compensation for extra work, claiming a loss of from \$8,000 to \$10,000 on both sections. At the meeting of the Board held May 13, 1899, it was —

*Voted*, That there be allowed Mathers & Sullivan the sum of two thousand dollars (\$2,000) in full settlement of all claims and demands of whatever nature on sections 21 and 22, Neponset valley system.

Said amount has been accepted and a release executed by said contractors for full settlement and satisfaction of all claims whatsoever, whether under said contracts or in addition thereto, accruing out of the construction of said sections 21 and 22 of the Neponset valley sewerage system.

At the meeting of the Board held Nov. 26, 1898, Mr. Snow, of the firm of Gaston & Snow, counsel for Henry P. Nawn, contractor upon sections 13, 14, 15 and 16, Neponset valley system, appeared with his client (Mr. Nawn) in regard to the claim for \$4,280 for extra work on said sections, caused by an excess of rock excavation; and also for loss of five weeks' time, occasioned by an order issued by

the chief engineer, upon request from the Tileston & Hollingsworth Company, to stop work on Section 16, pending the investigation of the damages to the chimney of said company (Mattapan Mills) in Hyde Park, caused by blasting, excavating, etc., in the tunnel in the immediate neighborhood. After full consideration in regard to said claim, the Board, at its meeting on May 13, 1899,—

*Voted*, That there be allowed Henry P. Nawn the sum of one thousand dollars (\$1,000), in full settlement of all claims and demands of whatever nature on sections 13, 14, 15 and 16, Neponset valley system.

This amount was not accepted, and later suit was brought against the Commonwealth of Massachusetts, on account of an alleged breach of contract.

#### CONNECTIONS AUTHORIZED DURING THE YEAR UPON THIS SYSTEM.

During the year ending Sept. 30, 1899, 5 connections were authorized with the metropolitan sewer upon this system, as follows: Boston (Dorchester district), 2; Boston (West Roxbury district), 1; and Hyde Park, 2.

A full list of all connections that have been made and authorized upon this system will be found in Table L of the Appendix.

To meet the expenses (outstanding bills, amounts due and claimed by contractors and in settlement of land damages), the Legislature, under chapter 241, Acts of 1899, appropriated the sum of \$25,000, a recommendation for which was contained in our last annual report.

The expenditures upon the Neponset valley system for the year ending Sept. 30, 1899, have been \$18,842.41, which, with the amount already expended, \$821,602.32, makes \$840,444.73 expended to date.

### CHARLES RIVER VALLEY SYSTEM.

The case of Albert Brackett was pending in the superior court for a number of years, until some time ago it was stricken from the list and dismissed from the docket, but on motion of the petitioner the case was returned to the list. In January, 1899, notice was received from the office of the Attorney-General that this case had been settled for \$2,250. Said land is located in Newton, and was included within a taking dated March 7, 1891.

A connection was authorized to be made on this system Sept. 16, 1899, in Watertown, by means of a 6-inch branch on the southerly side of the metropolitan sewer in said town, near Water Street, at Station 40+65, Section F. Said connection is for the drain of the Locomobile Company, and is made with the understanding that it shall be changed and connected with the local sewers as soon as they are built in this vicinity, as the building is situated too low to connect with the local sewer.

A full and complete list of all connections approved to date can be found in the Appendix, Table L.

### HIGH-LEVEL SEWER.

The Legislature, under chapter 424, Acts of 1899, appropriated the sum of \$4,600,000 for the construction of a high-level gravity sewer, for the relief of the Charles and Neponset River valleys, as outlined in a special report of this Board, transmitted to the General Court. Said act specially provides that no part of the said proposed outlet, or sewerage system, between Hyde Park and the outlet, shall be constructed before the year 1900, and until plans for said outlet shall be further considered by said Board, and adopted and approved by the State Board of Health.

At a meeting held July 1, 1899, the following communication was forwarded to the State Board of Health, to accompany plan, entitled, "Plan showing outlet at Nut Island recommended for the high-level sewer, Boston, Mass. :"—

#### COMMONWEALTH OF MASSACHUSETTS.

METROPOLITAN SEWERAGE COMMISSION, 1 MT. VERNON STREET,  
BOSTON, July 1, 1899.

*To the Honorable the State Board of Health, State House, Boston, Mass.*

GENTLEMEN:—The plan for an outlet for a high-level gravity sewer for the relief of the Charles and Neponset River valleys, having been further considered by the Metropolitan Sewerage Commissioners, is herewith presented to the State Board of Health for their adoption and approval, in accordance with chapter 424 of the Acts of 1899.

This Board, or its engineer, will be glad to furnish any further information you may require.

For the Board, very truly yours,

(Signed) HERBERT E. BRAYTON,  
*Clerk.*

As the State Board of Health is at the present time considering the general subject of sewage discharge into Boston harbor, for which an appropriation of \$10,000 was made by the Legislature of 1899, no reply has as yet been received

other than an acknowledgment of said communication, with the statement that the same is being considered by said State Board of Health.

Following is the resolve under which the investigation is being made :—

[CHAPTER 65.]

RESOLVE DIRECTING THE STATE BOARD OF HEALTH TO REPORT UPON THE GENERAL SUBJECT OF THE DISCHARGE OF SEWAGE INTO BOSTON HARBOR.

*Resolved*, That the state board of health is hereby authorized and directed to consider the general subject of the discharge of sewage into Boston harbor and the disposal of sewage for the metropolitan districts of the Commonwealth, and to report a plan or plans for an outlet for a high-level, gravity or other sewer, for the relief of the Charles and Neponset river valleys. Said board may employ such engineering and other assistance and incur such expense as may be necessary to carry out the purposes of this resolve. All bills for expenses incurred by the board under the provisions of this resolve shall be approved by the governor and council before they are sent to the auditor for payment; and in no event shall the expense exceed the sum of ten thousand dollars. The report herein required shall be made to the general court on or before the first day of May in the year nineteen hundred, and if any recommendations are made by the board a bill embodying them shall accompany the report. [Approved April 28, 1899.]

Realizing the importance of making an appraisal of the land through which the sewer line is to pass, as early as possible before the beginning of the construction of this great work, the Board selected experts to appraise the damage to the various estates along the line of the high-level sewer. Said appraisers have not as yet returned their report upon said appraisal.

After contract maps and plans on this system were carefully examined and discussed, and rights of way for the line of sewer were considered, it was voted to advertise for bids for sections 65, 66, 68 and 69, on the high-level sewer, the same to be opened Oct. 7, 1899.

These first four sections of this great system are situated in West Roxbury and Hyde Park, covering a distance of 11,535 feet, of which about 5,300 feet is tunnel work.

Bids were invited for furnishing and delivering vitrified sewer pipe for underdrain along the route of this system in Hyde Park and West Roxbury, from a point in Hyde Park near the Neponset River at Monponsett Street to a point in West Roxbury on Hyde Park Avenue, near the Mount Hope station, said pipe to be equal in quality to the best Akron. These bids were received on Saturday, Sept. 23, 1899, a full list of which will be found in the Appendix.

The Board having decided that it was for the interest of the Commonwealth to take the fee in certain parcels of land along the line of the high-level sewer, negotiations were made with the following parties for such lands: George S. Lee, trustee; Elise B. and W. R. Richards; and the estate of William Sumner. At the present time but partial settlements have been made, although negotiations are being pushed as rapidly as possible.

The expenses upon the high-level sewer for the year ending Sept. 30, 1899, including the expenditures for the investigation, are \$44,608.46.

#### RECEIPTS.

The amount of receipts from sales, etc., for the year beginning Oct. 1, 1898, and ending Sept. 30, 1899, is \$620.61. The general character of these receipts is as follows: Sale of inspectors' offices, \$45; sale of coal and oil, \$33.08; receiving surface drainage from the Everett system into the metropolitan sewer, \$100; pumping salt water from ammonia condensers, \$423.53; rebuilding man-hole on Brookline Avenue, \$19; making a total of receipts for the year of \$620.61.

[Jan.]

## DISBURSEMENTS BY YEARS TO SEPT. 30, 1899.

	Year ending Sept. 30, 1889.	Year ending Sept. 30, 1890.	Year ending Sept. 30, 1891.	Year ending Sept. 30, 1892.	Year ending Sept. 30, 1893.	Year ending Sept. 30, 1894.	Year ending Sept. 30, 1895.	Year ending Sept. 30, 1896.	Year ending Sept. 30, 1897.	Year ending Sept. 30, 1898.	Year ending Sept. 30, 1899.
Office expenses,	\$1,161.29	\$28,792.56	\$30,437.29	\$31,220.76	\$35,191.97	\$38,669.38	\$19,652.19	-	-	-	-
North Metropolitan system,	116,492.65	582,936.06	982,798.49	1,172,269.02	1,115,190.19	606,488.61	\$191,312.02*	\$9,785.61	\$83,385.64	\$6,001,749.02	
Charles River valley system.	18,329.41	381,149.33	280,388.23	28,882.27	25,300.13	1,927.35	209,087.56	\$42,023.27	789,134.27		
Both systems, *	2,696.20	5,597.86	7,703.16	12,788.61	15,864.20	302.20	33,750.94*	325.21	11.75	-	
Neponset valley sys. ten.	-	-	-	-	2,649.95	200,604.35	405,486.31	212,861.71	18,842.41	840,444.73	
Wakefield branch, *	-	-	-	-	-	125.98	27,199.11	8,281.36	5.84	35,612.29	
Stoneham branch, *	-	-	-	-	-	-	2,802.68	8,764.70	6.72	11,674.10	
Everett branch, *	-	-	-	-	-	-	-	4,574.73	50,302.39	54,877.12	
Lexington branch, *	-	-	-	-	-	-	-	56,568.69	12,001.46	68,585.15	
High-level sewer investigation.	-	-	-	-	-	-	-	111,810.62	13,867.44	28,677.96	
High-level sewer,	-	-	-	-	-	-	-	-	18,930.50	18,930.50	
	\$1,161.29	\$164,311.01	\$1,282,050.64	\$1,249,126.87	\$1,160,092.91	\$631,020.30	\$428,888.48	\$477,886.68	\$312,074.07	\$197,342.40	\$6,033,885.14

Total expended to Sept. 30, 1899. . . . .

\* The accounts "Office expenses" and "Both systems" are charged off to the North Metropolitan system and the Charles River valley system, — \$6 per cent. to the former and 15 per cent. to the latter (North Metropolitan system, \$191,312.02; Charles River valley system, \$33,750.94). This is the proportion made by the appropriation commission in 1891, and has been found by experience to be substantially correct.

† Although expended during the year ending Sept. 30, 1898, did not appear in last year's table, as it was a special appropriation. Since then, by chapter 424, Acts of 1899, the amount appropriated for "Investigation" has been made a part of the loan for the high-level sewer.

On Oct. 8, 1898, Mr. Edward P. Fisk of Boston, who had held the position of clerk of this Board since its organization, presented his resignation as clerk, owing to ill health, which compelled this action. Said resignation was considered, but no action was taken until at the meeting on Saturday, Oct. 15, 1898, when the following was ordered to be inscribed upon the records, and a copy of the same ordered to be forwarded to Mr. Fisk:—

Fully appreciating the very faithful and efficient service rendered the Commonwealth by Edward P. Fisk, who has been clerk of this Board since its original organization, in 1889;

Sincerely regretting the necessity which compels him to seek recreation and rest from labor and to tender his resignation as clerk;

Hoping that he may very soon be fully restored to perfect health, we do very unwillingly accept his resignation, to take effect from Oct. 15, 1898.

Owing to the vacancy thus made by the resignation of Mr. Fisk, Herbert E. Brayton of Fall River, who had been connected with the Board as assistant clerk, and who also acted as clerk during the temporary absence of Mr. Fisk, was promoted to the position of clerk of the Board, said change to take effect as of Oct. 15, 1898.

Hosea Kingman of Bridgewater was appointed by the Governor and confirmed by the Council as his own successor as a member of the Board of Metropolitan Sewerage Commissioners for the term of three years, ending on the first Monday of January in the year 1902. This is his fourth appointment as a member of this Board, and upon the completion of said term he will have served thirteen years thereon.

At a meeting of the Board, held Saturday, April 29, 1899, the chief engineer announced the death of Charles H. Swan, which occurred very suddenly, on the 17th instant, at his residence in Roxbury.

The Board thereupon adopted the following resolutions :—

*Resolved*, That, by the death of Charles H. Swan, this department of the Commonwealth has lost a conscientious, able and learned member of its engineering staff, a gentleman who held the affection, respect and admiration of all. His services to the Commonwealth were of the highest value, and his loss is one which will be greatly felt.

*Resolved*, That the foregoing be spread upon the records of the Board, and a copy thereof transmitted to his family.

In accordance therewith, a copy was forwarded by the clerk and duly acknowledged.

At the annual meeting of the Board, held on the first Monday in February (February 6), as provided in the act (chapter 439, Acts of 1889), Hosea Kingman of Bridgewater was again chosen chairman and Herbert E. Brayton of Fall River clerk for the year.

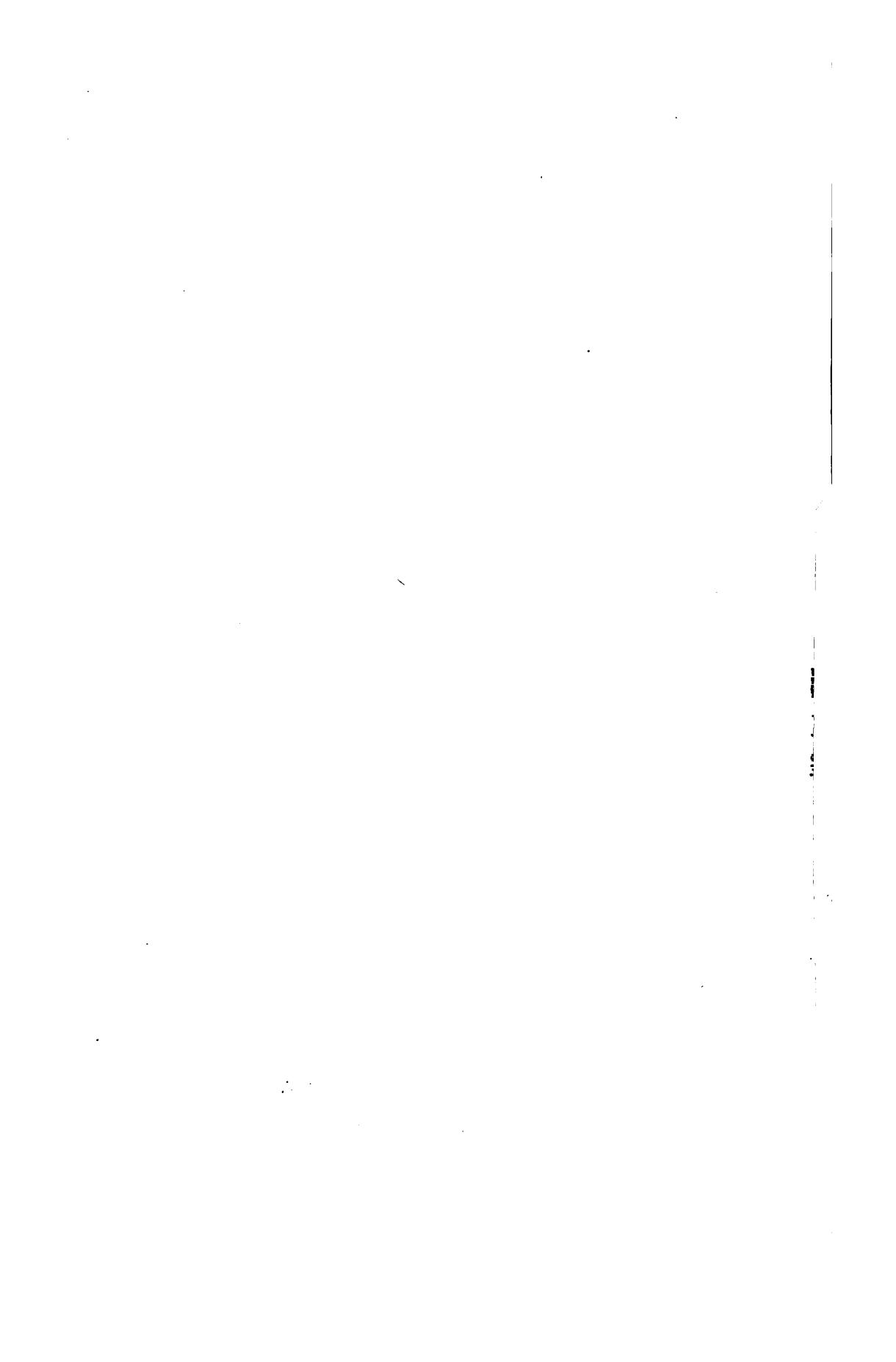
The Appendix contains tables showing in detail the receipts and expenditures for the year, also the assets and liabilities to date.

HOSEA KINGMAN,  
TILLY HAYNES,  
GEORGE A. KIMBALL,  
*Metropolitan Sewerage Commissioners.*

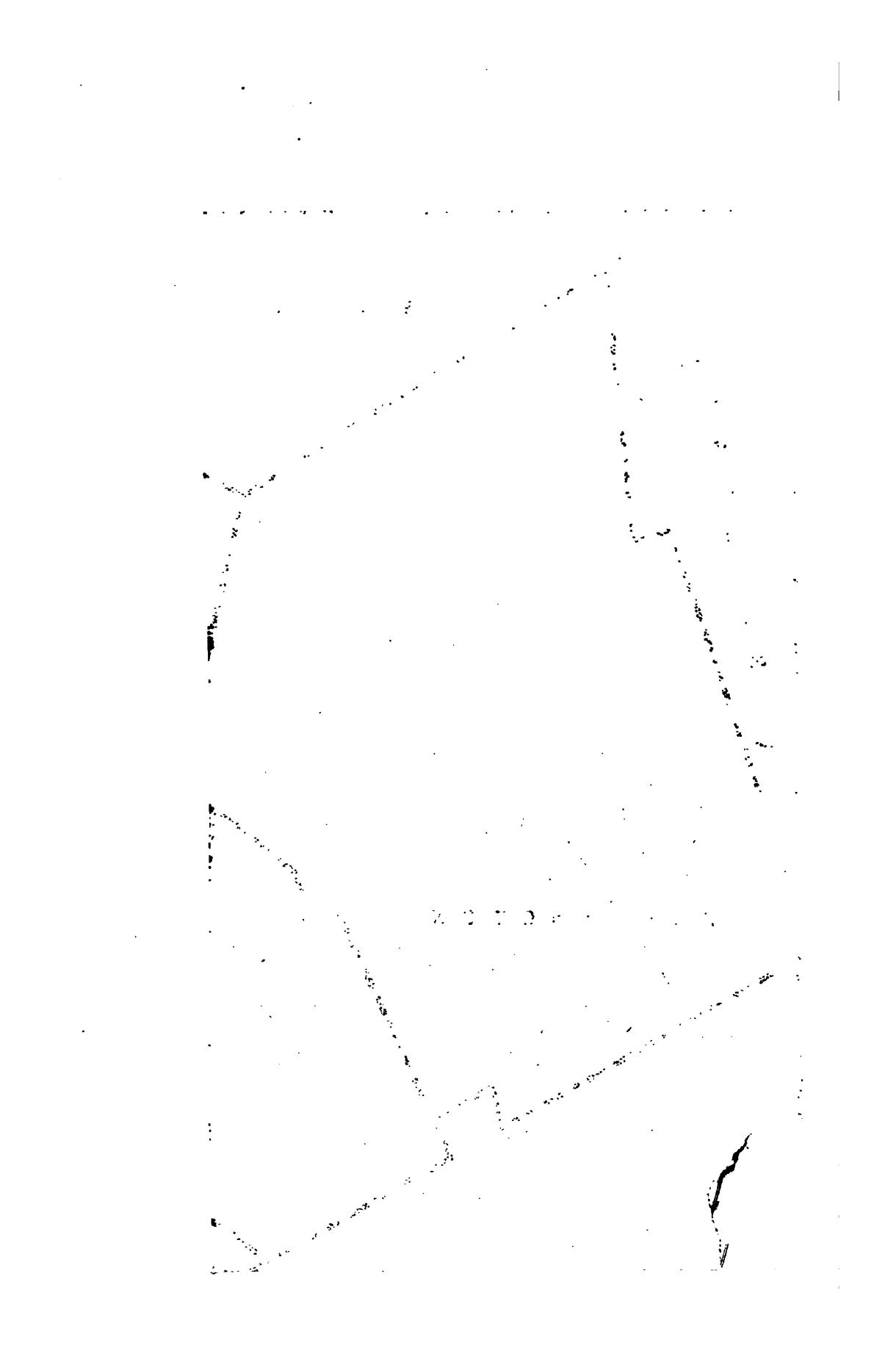
BOSTON, Sept. 30, 1899.



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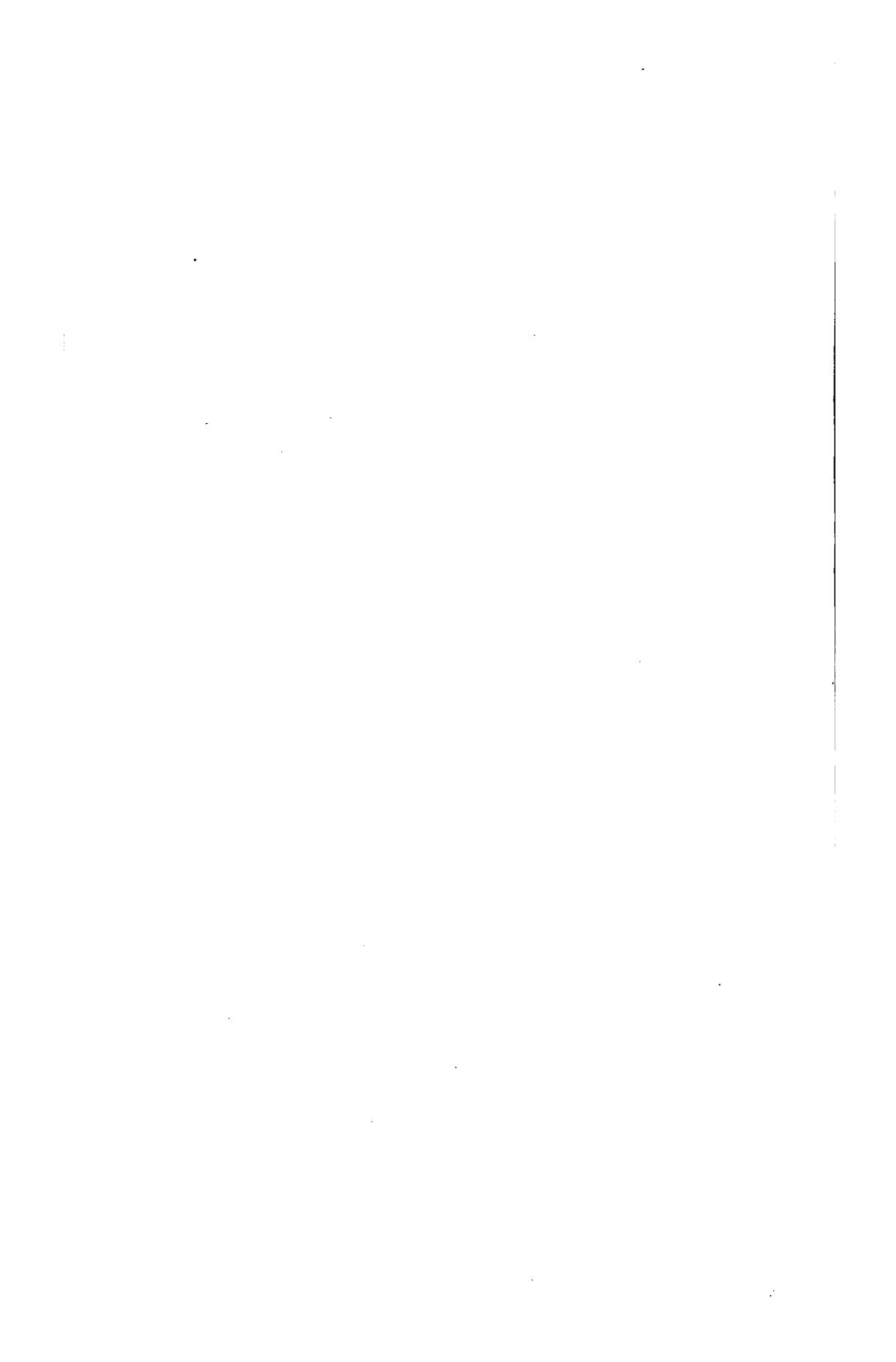
**REPORT OF CHIEF ENGINEER**

**AND**

**SUPERINTENDENT.**

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# REPORT OF CHIEF ENGINEER

AND

## SUPERINTENDENT.

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BOSTON, Sept. 30, 1899.

HOSEA KINGMAN, TILLY HAYNES, GEORGE A. KIMBALL,  
*Metropolitan Sewerage Commissioners.*

GENTLEMEN:—The following report concerning the metropolitan sewerage system for the year ending Sept. 30, 1899, is respectfully submitted.

The original metropolitan sewerage act (chapter 439 of the Acts of 1889) provided for the construction of main sewers for the relief of a metropolitan area of about 114 square miles in the Mystic and Charles River valleys. This area has been divided under the act into two districts, and provided with main sewers forming respectively the North Metropolitan and Charles River systems. The former district, as originally constituted, includes the isolated Charlestown and East Boston areas of the city of Boston, the cities of Cambridge, Somerville, Malden, Chelsea, Medford, Everett and Woburn, and the towns of Stoneham, Melrose, Winchester, Arlington, Belmont and Winthrop. The Charles River district comprises Brighton and part of the Back Bay section of Boston, the cities of Waltham and Newton and the towns of Brookline and Watertown.

The Charles River valley system was completed and put in operation in the spring of 1892. On the North Metropolitan system, the three large pumping stations were all in operation in the summer of 1895, and the whole system, as originally authorized, has been in operation since the early part of 1896.

Successive Legislatures have added certain districts to the original area of 114 square miles. Chapter 406 of the Acts of 1895 provided for the Neponset valley system, comprising parts of the West Roxbury and Dorchester districts of Boston, together with the towns of Dedham, Hyde Park and Milton. The total area of this district is about 44 square miles. Work on this system was begun in 1896 and substantially completed in 1897. By chapter 414, Acts of 1896, the southerly portion of the town of Wakefield,

about 1 square mile in extent, was incorporated with the North Metropolitan system, and the necessary works were completed late in 1897. The operation of this act involved the purchase by the Commonwealth of about three-quarters of a mile of sewer from the town of Melrose. In like manner, by chapter 520 of the Acts of 1897, the town of Lexington was authorized to connect the sewerage systems of its central and eastern villages with the North Metropolitan sewers, making a further addition of about 5 square miles to the district. The necessary metropolitan sewer extension in Arlington, to the Lexington boundary line, was constructed in 1898, but no Lexington sewers have yet been connected therewith. A length of about  $2\frac{1}{2}$  miles of local sewer has been purchased by the Commonwealth from the town of Arlington under this act.

A more noteworthy addition to the metropolitan sewerage area, amounting to about 21 square miles, was effected in 1899 by the inclusion of important districts in Roxbury, West Roxbury and Dorchester of the city of Boston, and the whole of the city of Quincy. The Charles River and Neponset valley systems, already referred to, now discharge into the low-level sewers of the main drainage works of the city of Boston, the former at Gainsborough Street, the latter through the Dorchester interceptor at Granite Avenue. Heavy and increasing rentals are being paid by the Commonwealth to the city for this service, including the cost of pumping. The conditions anticipated when the Boston low-level system was designed, twenty-five years ago, have been exceeded by the growth of the seweried area within the city, while the addition of the Charles River and Neponset valley districts made further large demands upon the capacity of the works. These considerations led to preliminary studies by this department as to the probable cost of sewage disposal for these metropolitan systems, other than through the main sewers and pumping station of the Boston main drainage works. The results of these studies were embodied in an engineering report, dated Oct. 24, 1897, published in the ninth annual report of the commissioners. This was followed by a special report of the commissioners, issued early in 1899, dealing with the problem in greater detail and recommending the construction of a high-level gravity sewer for the relief of the Charles and Neponset valleys, with an independent outfall into the harbor off Nut Island. The Legislature adopted the recommendations of this report, and gave effect thereto by chapter 424 of the Acts of 1899, which appropriated the sum of \$4,600,000 for the purposes of the act. The operation of the act is to group into a new district the former Charles and Neponset River areas, together with the 21 square miles of high-level territory already

referred to, comprising all the metropolitan areas south of the Charles River, together with Watertown and Waltham, north of the river. This area, embracing in all about 107 square miles, will be hereafter known as the South Metropolitan sewerage district. The object of the undertaking is to provide for as large a portion of the district as possible by gravity, leaving the remainder to be dealt with by pumping. After the construction of the high-level sewer, the sewage of the Charles River valley will be diverted from Gainsborough Street to a pumping station to be erected near the intersection of Huntington and Longwood avenues, and there raised about 40 feet into the high-level system.

The high-level sewer will receive at various points, by gravity, the sewage from those parts of Boston already referred to, and will intercept in the same way the drainage from 42 of the 44 square miles originally embraced in the Neponset River area. The sewage of Quincy will reach the high-level sewer partly by pumping, partly by gravity.

Including the above additions, the metropolitan sewerage district embraces a total area of about 185 square miles, as shown on the general map accompanying this report and outlined in detail in the following table:—

*Table showing the Areas and Estimated Populations within the Metropolitan Sewerage District, Sept. 30, 1899.*

CITY OR TOWN.	Area (Square Miles).	Estimated Population Sept. 30, 1899.
Arlington, . . . . .	5.196	7,783
Belmont, . . . . .	4.667	8,768
Boston, portions of:—		
North Metropolitan system, . . . . .	8.450	90,381
South Metropolitan system, . . . . .	20.915	98,980
Brookline, . . . . .	6.807	19,391
Cambridge, . . . . .	6 111	91,264
Chelsea, . . . . .	2.240	33,779
Dedham,* . . . . .	14.100	7,200
Everett, . . . . .	8.340	24,516
Hyde Park, . . . . .	4.572	18,046
Lexington,* . . . . .	5.110	2,730
Malden, . . . . .	5.074	36,101
Medford, . . . . .	8.350	18,176
Melrose, . . . . .	3.730	14,873
Milton, . . . . .	12.589	6,624
Newton, . . . . .	18.080	32,484
Quincy, . . . . .	12.555	24,882
Somerville, . . . . .	3.965	61,799
Stoneham, . . . . .	5 495	6,776
Wakefield,* . . . . .	.950	760
Waltham, . . . . .	13.632	23,055
Watertown, . . . . .	4.045	8,998
Winchester, . . . . .	5.952	7,149
Winthrop, . . . . .	1.613	5,558
Woburn, . . . . .	12.705	16,556
Totals, . . . . .	185.183	666,188

\* Part of town.

Within the North Metropolitan, Charles River and Neponset valley districts, a total length of 70.17 miles of metropolitan sewers has been constructed to date. The position, lengths and sizes of these sewers are shown in the following tables, together with a list of the public and special connections made with the various systems in each city and town:—

#### NORTH METROPOLITAN AREA.

*Table showing Locations, Lengths and Sizes of Metropolitan Sewers within the North Metropolitan Area, and the Number of Public and Special Connections made with the System in Each City and Town*

CITY OR TOWN.	Size of Sewers.	Length in Miles.	Public Connections, Sept. 30, 1890.	SPECIAL CONNECTIONS.	
				Character or Location of Connection.	Number in Operation.
Boston:—					
Deer Island,	6' 3" to 9', . . . . .	1.367	2	- - -	-
East Boston,	9' to 1', . . . . .	5.467	16	- - -	-
Charlestown,	6' 7"×7' 5" to 1', . . .	3.292	11	Navy Yard, . . .	8
Winthrop,	9', . . . . .	2.864	4	Club house, . . .	1
Chelsea, . .	8' 4"×9' 2" to 2' 1"×2' 10", . . .	2.212	3	Rendering works, Metropolitan Water Board, blow-off.	2
Everett, . .	8' 2"×8' 10" to 4' 8"×5' 1", . . .	2.925	8	Metropolitan Water Board, blow-off.	1
Malden, . .	3' 9"×4' 1" to 1' 3", . . .	3.140*	20	Metropolitan Water Board, blow-off.	1
Melrose, . .	1' 10"×2' 9" to 10", . . .	3.843†	27	Private houses, . . .	82
Cambridge, . .	5' 2"×5' 9" to 1' 3", . . .	5.963	10	Private houses, . . .	68
Somerville, . .	6' 6"×7' 2" to 1' 10"×2' 3", . . .	3.471	8	Slaughter-house, . . .	1
Medford, . .	4' 8"×5' 1" to 10", . . .	5.359	16	Slaughter-houses(8), . . .	1
Winchester, . .	2' 11"×3' 3" to 1' 3", . . .	6.403	8	Private houses, . . .	5
Stoneham, . .	1' 3" to 10", . . . . .	0.010	2	Tannery, . . . . .	2
Woburn, . .	1' 10"×2' 4" to 1' 3", . . .	0.933	3	Glue factory, . . . .	1
Arlington, . .	1' 6" to 10", . . . . .	8.520‡	27	Private houses, . . .	42
Belmont,§ . .	- - - - -	-	1	- - -	-
Wakefield,§ . .	- - - - -	-	-	- - -	-
		60.769	170		210

\* This includes .99 of a mile of sewer purchased from the city of Malden.

† This includes .736 of a mile of sewer purchased from the town of Melrose.

‡ This includes 2.681 miles of sewer purchased from the town of Arlington.

§ The metropolitan sewer extends but a few feet into the towns of Belmont and Wakefield.

|| This includes 2.7 miles of Mystic valley sewer in Medford, Winchester and Woburn running parallel with the metropolitan sewer.

## CHARLES RIVER AREA.

*Table showing Locations, Lengths and Sizes of Metropolitan Sewers within the Charles River Valley Area, and the Number of Public and Special Connections made with the System in Each City and Town.*

CITY OR TOWN.	Size of Sewers.	Length in Miles.	Public Connection, Sept. 30, 1899.	SPECIAL CONNECTIONS.	
				Character or Location of Connection.	Number in Operation.
Part of Boston proper.	6' 6" to 5' 6", . . . .	1.500	8	Administration building, Boston Park Department.	1
Boston (Brighton).	5' 6" to 4' 2"×4' 9", . .	3.688	10	Abattoirs, . . .	8
Brookline,	5' 6", . . . .	0.127	1	- - -	-
Newton, .	4' 2"×4' 9" to 3' 6"×4', .	2.057		Private houses, . . .	2
Watertown, .	4' 2"×4' 9" to 8' 11"×4' 5",	0.725	5	Factory, . . . .	1
Waltham, .	3' 6"×4", . . . .	0.001	1	- - -	-
		8.098	81		
					7

## NEPONSET VALLEY AREA.

*Table showing Locations, Lengths and Sizes of Metropolitan Sewers within the Neponset River Valley Area, and the Number of Public and Special Connections made with the System in Each City and Town.*

CITY OR TOWN.	Size of Sewer.	Length in Miles.	Public Connection, Sept. 30, 1899.	SPECIAL CONNECTIONS.	
				Character or Location of Connection.	Number in Operation.
Milton, . . .	1' 8" to 8", . . . .	0.05	8	- - -	-
Boston (Dorchester).	3'×4' to 2' 6"×2' 7".	2.87*	6	- - -	-
Hyde Park, .	4' 6"×4' 7" to 4'×4' 1", .	3.09	10	- - -	-
Dedham, . .	4'×4' 1" to 3' 9"×3' 10", .	2.85	-	- - -	-
Boston (West Roxbury).	3' 9"×3' 10" to 1', . .	2.94	2	Parental school, . .	1
		11.30	21		1

\* This includes 1.24 miles of sewer purchased from the city of Boston.

The cost of these metropolitan sewers to date, including pumping stations, siphons and appertaining structures, is given in detail in the commissioners' report (page xxviii), and may be summarized as follows: —

15 miles, North Metropolitan system, . . . . .		\$5,262,397 68
8 miles, Charles River valley system, . . . . .		789,134 27
11 miles, Neponset River valley system, . . . . .		840,444 73
Total cost of 70 miles of metropolitan sewers, to Sept. 30, 1899, .		\$6,891,976 68

According to the last annual report of the Board, there were 69.03 miles of metropolitan sewer on Sept. 30, 1898. There have been added, therefore, during the year, about 1.14 miles of sewers. This addition includes about .15 of a mile of new sewer constructed during the year in Arlington, to complete the extension to Lexington, as detailed below: —

NUMBER OF SECTION.	Location.	Size (Inches).	LENGTH.	
			Feet.	Miles.
Section 63 (part of), . . . . .	Arlington, . . . . .	15	811	.15

The remainder of the 1.14 miles added during the year consists of local sewers purchased on Oct. 8, 1898, from the city of Malden in connection with the branch to the westerly side of Everett, authorized by chapter 215 of the Acts of 1898, to provide an outlet for the sewage of about 165 acres in that city, draining naturally through Malden. Particulars of these sewers are given below: —

LOCATION.	Diameter (Inches).	Length (Feet).	Brick or Pipe.
Charles Street, . . . . .	36	385	Brick.
Main Street, . . . . .	36	347	Brick.
Eastern Avenue, . . . . .	36	2,448	Brick.
Bryant Street, . . . . .	18	1,086	Pipe.

Total length, 5,216 feet, = .99 mile.

Regulator and overflow at Charles Street and 24 man-holes.

For these sewers \$50,096.51 was paid to the city of Malden, in full, on Oct. 8, 1898.

The population of the North and South Metropolitan sewerage districts was enumerated as 561,894 by the semi-decennial State census of 1895. It is estimated as amounting to 656,188 on Sept. 30, 1899, as shown in detail in the table on page 5. The estimated population of the North Metropolitan, Charles River and Neponset valley districts on the same date amounts to 578,176, as shown in the following table: —

*Table giving Details of Areas, Estimated Resident Population within Area, Estimated Populations contributing Sewage, Miles of Local Sewers connected with Metropolitan Sewers, and Number of Connections.*

*North Metropolitan System.*

Area (Square Miles.).	Estimated Total Population.	Miles of Local Sewer connected.	Estimated Population contributing Sewage.	Ratio of Contributing Population to Total Population.	Connections made with Metropoli- tan Sewers.	
					Public.	Special.
77.93	422,360	436.89	296,180	Per Cent. 70.1	170	210

*Charles River Valley.*

42.06	117,120	260.86	89,288	76.2	31	7
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*Neponset Valley.*

44.27	88,696	29.32	8,692	22.5	21	1
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*Summary.—Entire Metropolitan District, exclusive of High-level Area added in 1899.*

164.26	578,176	726.57	394,160	68.2	222	218
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By reference to pages 18–20 of the tenth annual report of the commissioners, it will be seen that the population of these three districts, representing the area for which metropolitan sewers have already been provided, was estimated at 555,300 on Sept. 30, 1898. It seems probable, therefore, that there has been an increase in this population of 22,876 persons, equal to 4.12 per cent., during the year under review. Of the estimated population of 578,176 on Sept. 30, 1899, about 394,160, representing 68.2 per cent., were on that date contributing sewage to the metropolitan sewers through a total length of about 726 miles of local sewers owned by the individual municipalities. These sewers are connected with the metropolitan system by 222 public and 218 special connections. The latter consist largely of house drains on local sewers acquired by purchase from various cities and towns for use as main sewers.

Further comparison of the figures for the two periods indicates that the population contributing sewage has increased within the year by about 39,900, or at the rate of 11.3 per cent., as against an increase in the total population of 4.12 per cent.; that 37 miles of local sewers have been added to those connected a year ago, and that 68 public and 178 special connections have been made with the system during the year.

The following table shows the average daily volumes of sewage handled at each of the four North Metropolitan pumping stations during the year ending Sept. 30, 1899, as compared with the corresponding volumes for the previous year:—

PUMPING STATION.	AVERAGE DAILY PUMPAGE.				
	Year ending Sept. 30, 1898.	Gallons.	Year ending Sept. 30, 1899.	Increase.	
Deer Island, . . . . .	41,100,000	Gallons.	47,600,000	Gallons.	Per Cent.
				6,500,000	15.8
East Boston, . . . . .	38,700,000		46,200,000	7,500,000	19.4
Charlestown, . . . . .	24,800,000		28,000,000	3,200,000	12.9
Alewife Brook, . . . . .	8,175,000		8,501,000	326,000	10.2
Totals, . . . . .	107,775,000		125,301,000	17,526,000	16.3

It appears that the increase in the average daily pumpage for all stations is at the rate of 16.3 per cent. for the year. The increase in the total volume of sewage discharged at the Deer Island outfall is at the rate of 15.8 per cent.

Chapter 424 of the Acts of 1898 provided for additional pumping plant at the four stations of the North Metropolitan system. The new installations at the three large stations are of the same type as the original plants. The addition to the capacity at the Deer Island and East Boston stations will amount to 50 per cent. At Charlestown the existing capacity will be doubled. At the Alewife Brook station the additional plant is designed for a capacity equal to 20 cubic feet per second raised 13 feet. Contracts for these installations have been awarded, as detailed in the following table:—

NAME OF CONTRACTOR	Station.	Date of Contract.	Amount of Contract.	Amount paid on Contract	Date for Completion.
Edward P. Allis Company of Milwaukee, Wis., . . . . .	Deer Island, .	Oct. 1, 1898,	\$27,200 00	—	April 1, 1900
Edward P. Allis Company of Milwaukee, Wis., . . . . .	East Boston, .	Oct. 1, 1898,	25,600 00	\$12,800 00	Jan. 1, 1900
Edward P. Allis Company of Milwaukee, Wis., . . . . .	Charlestown, .	Oct. 1, 1898,	25,800 00	12,900 00	Oct. 1, 1899
The George F. Blake Manufacturing Company, Boston, . . . . .	Alewife Brook,	Sept. 17, 1898,	7,600 00	5,625 00	Feb. 17, 1899
Totals, . . . . .			\$86,100 00	\$31,325 00	

As the additional large engines and pumps are from the shops of the Edward P. Allis Company of Milwaukee, provision had to be made for inspection in that city. The cost of this, together with similar inspection of boilers, etc., in Boston, has amounted to \$818.81 since the commencement of the work.

Foundations and connections for these extensions have been constructed by day labor, under the direction and supervision of the engineering department, at an aggregate cost of \$48,854.77.

The additional plant at the Alewife Brook pumping station has been erected and operated since March of this year, but the formal tests, preparatory to accepting the plant by the commissioners, have not yet been made. The work of installing the additions at the Charlestown station is so far advanced that its completion may be expected some time in November, to be followed by similar work at East Boston and Deer Island, which, it is anticipated, will be completed during the coming winter.

For the work on the proposed high-level gravity sewer for the relief of the Charles River and Neponset valley areas, authorized by chapter 424 of the Acts of 1899, the engineering force was very largely increased after June 1. Surveys are now in progress from the proposed outfall off Nut Island to the point of connection with the Charles River valley sewer, near the intersection of Huntington avenue and Ruggles Street. Contracts and detailed plans for four sections of this work, extending northward from the Neponset River to near the Mount Hope station of the Providence division of the New York, New Haven & Hartford Railroad, a distance of about two miles, have been completed. These contracts have been advertised, and it is anticipated that the work thereon will be prosecuted during the ensuing winter months.

Besides the installation of additional pumping plants, the constructional work of the year has included the completion of the Lexington extension, largely constructed at the date of the last report.

**DETAILED STATEMENT RELATING TO CONSTRUCTION ON THE NORTH METROPOLITAN SYSTEM DURING THE YEAR ENDING SEPT. 30, 1899.**

The purchase by the Commonwealth of about 2.6 miles of trunk sewers, forming part of the local system of the town of Arlington, was recorded on page 11 of last year's report. This length of sewer is now known as Section 52 of the metropolitan sewerage system. At the date of the last report an extension to the easterly line of Lexington (Section 53) was in progress, 8,700 lineal feet

had then been constructed, and the remaining length of 810 feet was completed in January of this year.

The total expenditure on the Lexington extension to date is as follows: —

Section 52, paid to the town of Arlington, in full, . . . . .	\$42,400 13
Section 53, paid to Long & Little, contractors, and for inspection and supplies, . . . . .	26,185 02
	<hr/> \$68,585 15

The following is a detailed statement of the work on this section: —

#### SECTION 53 (LEXINGTON BRANCH), ARLINGTON AND LEXINGTON.

*Location.* — From a point at the junction of Massachusetts Avenue and Lowell Street, through Lowell Street to near the Lexington Branch of the Boston & Maine Railroad, thence within and parallel to the railroad location to Park Avenue, through Park Avenue to Massachusetts Avenue, thence through Massachusetts Avenue to the Lexington town line.

*Assistant Engineer in Charge.* — Frank I. Capen.

*Contractors.* — Long & Little.

Length (Feet).	Size.	Average Cut (Feet).
4,510.58	18" and 15", . . . . .	11.25

Length completed since Sept. 30, 1898, . . . . . 810 58 feet.

Average cost per lineal foot for whole section, \$6.03.

This includes 3,223 cubic yards of rock excavation and about 200 lineal feet of pile foundation.

#### FOUNDATIONS AND CONNECTIONS FOR ADDITIONAL PUMPING PLANT.

*Deer Island Station.* — Work on the foundations and extensions at this house was begun in February and finished in August of this year. To provide for an ultimate fourth pump in the future, a fourth pit was constructed without the lines of the present station, at its easterly end. The excavation was about 33 feet deep. This pit is circular, 18 feet diameter internally, with Portland concrete bottom and sides, 3 feet thick. It is covered with a masonry roof. It was made water-tight, so that it can be used as a fresh-water reservoir, with a capacity of about 70,000 gallons.

An additional fresh-water reservoir, with a capacity of about 20,000 gallons, has been constructed at the easterly end of the station. It has an internal diameter of 20 feet and a depth of about 11 feet. It is covered with a wooden roof.

These two reservoirs afford a fresh-water storage of nearly 100,000 gallons. Both reservoirs are connected with the water and fire services of the station.

The suction channel was extended to the fourth pit. A stop-plank man-hole was constructed for the purpose of controlling the connection with the pit whenever opened up for further extensions.

The foundations for the new third engine and pump have been constructed, and the third pit, within the limits of the existing station, has been lined with brick and concrete masonry. A basement in the easterly end of the engine room has been finished and the steel framing for the engine-room floor erected.

The total cost of the work described above has been \$16,346.58.

*East Boston Station.*—Work was begun in preparation for the new pumps at this station in February and finished in August of this year.

A temporary fresh-water reservoir, with a capacity of about 7,000 gallons, was provided for use while a fourth pit was being constructed. As at Deer Island, this fourth pit is just east of the station, and will be available whenever a fourth engine and pump are required. It has been covered with a masonry roof and made water-tight, so as to serve for the storage of about 70,000 gallons of fresh water, and has been connected with the water service of the station. A suction channel has been constructed and a stop-plank man-hole built for controlling the connection between it and the pumping plant. The foundations for a third engine have been constructed, and the third pit, within the limits of the pumping station, lined with concrete and brickwork masonry. A basement has been finished at the easterly end of the engine house, and the steel framing for the floor erected. A check-valve man-hole has also been built on the third discharge tube, and the check-valve placed.

The total cost of the work in and about this station preparatory to the erection of the new pump and engine has been \$15,800.53.

*Charlestown Station.*—Work preparatory for the additional pumping plant at this station was commenced prior to Sept. 30, 1898. At the beginning of the year the enlargement of the discharge tube from the third pit was completed. The work of setting the valve in the suction man-hole was completed and the boiler foundations built. During the year the suction tube in the third pump well has been built and the pit itself lined with brick masonry.

Engine and pump foundations have also been constructed. These are of Portland concrete, supported in the former case by steel I-beams spanning the space between the walls of the building and

the third pump-well. As far as practicable, piles for supporting these foundations were driven to about the depth of the roof of the suction tunnel. A basement has been finished at the north end of the station. The basement floor is supported on I-beams running from the pump-well to the exterior wall of the building. The I-beams are surrounded with concrete, and inverted brick arches are turned between them to resist the upward force of the tide.

A permanent reservoir for the storage of 9,000 gallons of fresh water has been built under one-half of the coal house.

The bulkhead in the suction tunnel, connecting with the third pump-well, was removed by a diver.

The total cost of the work preparatory to the erection of the additional pumps at this station has been \$15,298 87.

*Alewife Brook Station.* — At this station foundations and connections for the new pump and engines were constructed early in the year, at a total cost of \$1,409.29. This includes the cost of the iron suction pipe for the new pump-well furnished by the commissioners under the contract with the engine builders, as well as the combined gate and check valves, one on each of the discharge tubes from the old pumps.

Under the contract with The George F. Blake Manufacturing Company, a pumping engine, boiler and fittings have been erected during the year.

The engine is of the vertical cross-compound type, having between the cylinders a centrifugal pump rotating on a horizontal axis. There is a horizontal multitubular re-heater between the cylinders, and a horizontal tubular feed-water heater on the exhaust pipe of the low-pressure cylinder. The air pump is of the horizontal direct double-acting type, with a jet condenser. The pump-wheel has curved vanes and casings provided with a vortex chamber. The discharge pipe is provided with 20-inch vertical gate and check valves. The boiler is of the vertical type, 4 feet 8 inches diameter, with large combustion-chamber. It has 156 tubes,  $7\frac{1}{2}$  feet long, 2 inches in diameter, and the smoke box is fitted with a copper coil feed-water heater.

#### CEMENT TESTING.

About 3,000 barrels of cement have been used during the year; of this quantity, 90 per cent. was Portland and the remainder of American Rosendale. The best European and American brands have been used, and carefully tested for fineness, tensile strength, specific gravity, checking, cracking, etc.

**OFFICE AND GENERAL ASSISTANTS.**

The following engineers, with engineering and other assistants, have been employed for the whole or part of the year. After the first of June the force was very largely increased, on account of surveys and studies in connection with the proposed high-level sewer.

***Assistant Engineers : —***

Charles H. Swan,\* special hydraulic studies and calculations.

Frank I. Capen, in charge of contract and day-work construction, North Metropolitan system, and maintenance studies (3 assistants).

Francis L. Sellew,\* chief office assistant in charge of draughting and designs (draughtsmen and assistants, 7 in all).

C. Barton Pratt, in charge of surveys for high-level sewer, north of Neponset River (15 assistants).

Frederick D. Smith, in charge of surveys for high-level sewer, between Neponset river and the outfall (18 assistants).

Frank A. Emery, in charge of records (4 assistants).

Theodore Horton, special hydraulic studies and calculations.

At the end of the year there were 53 engineering and other assistants employed, as outlined above.

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Mr. Charles H. Swan died very suddenly on April 17, 1899, after an illness of four days. Besides having been identified with the preliminary studies relating to metropolitan sewerage, he had been almost continuously connected with this department from its organization in 1889 until his death. He was an eminent mathematician and hydraulic expert, and his services in that capacity have been of the highest value to the commissioners. He was an esteemed member of the engineering staff, and the department has sustained a great loss by his death.

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**MAINTENANCE.**

In addition to the operation of the four pumping stations and the maintenance of the 70 miles of metropolitan sewers hitherto constructed, the work of this department includes the necessary engineering studies for proposed connections by cities and towns, together with minor additions to the sewers now controlled by the commissioners.

The following four tables show in detail the extent to which the tributary cities and towns are now using the metropolitan system : —

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\* For a portion of the year.

## NORTH METROPOLITAN SYSTEM.

*Table showing Cities and Towns delivering Sewage to this System; Approximate Miles of Sewer connected; Estimated Populations and Areas now contributing; Total Areas ultimately to contribute, and Present Populations on Such Areas; Ratios of Present Contributing Areas to Ultimate Areas, and Ratios of Populations now contributing to Present Total Populations.*

CITIES AND TOWNS.	MILES OF LOCAL SEWERS connected.	Separate or Comm. Bundles.	Number of Connections with Local Sewers.	Estimated Number of Persons served by Each House connection.*	Estimated Population now now contributing to Sewage.	Total Population estimated Present.	Estimated Population now now contributing to Sewage.	Area ultimately to contribute Sew. age.	Ratio of Contributing Areas ultimately to Population Total.	Ratio of Contributing Areas ultimately to Present Total.	Ratio of Contributing Areas ultimately to Ultimate Area.	Per Cent.
Boston (Deer Island), .	0.30	Separate, .	-	-	1,400†	1,400	-	-	-	-	-	-
Winthrop, . . .	23.99	Separate, .	1,358	3.9	5,296	5,560	1,51	1.61	95.0	95.8	95.8	93.8
Boston (East Boston), .	18.70	Separate and Combined, .	4,983	9.2	43,084	48,060	0.88	2.18	89.6	81.2	81.2	81.2
Chelsea, . . .	1.36	Combined, .	202	7.5	1,616†	33,780	0.09	2.24	4.5	4.0	4.0	4.0
Everett, . . .	13.82	Separate, .	1,153	5.6	6,487	24,510	0.86	3.34	26.3	26.7	26.7	26.7
Malden, . . .	41.30	Separate, .	3,026	5.7	17,248	36,100	2.44	5.07	47.8	48.1	48.1	48.1
Melrose, . . .	32.44	Separate, .	1,800	4.6	7,380	14,880	1.46	3.73	49.5	39.1	39.1	39.1
Boston (Charlestown), .	18.63	Separate and Combined, .	4,795	8.6	41,267§	42,290	0.64	1.27	97.5	50.4	50.4	50.4
Cambridge, . . .	108.18	Separate and Combined, .	13,276	6.7	88,949	91,270	4.83	6.11	97.3	79.0	79.0	79.0
Somerville, . . .	70.90	Separate and Combined, .	10,905	6.9	60,481	61,800	3.24	3.96	97.8	81.8	81.8	81.8
Medford, . . .	45.49	Separate, .	2,002	5.5	11,011	18,170	2.31	3.35	60.6	27.7	27.7	27.7

Winchester,	.	17.00	Separate,	.	460	5.3	2,470	7,150	0.88	5.95	34.5	14.8
Woburn,	.	13.97	Separate,	.	741	5.9	4,572	15,550	0.88	12.70	28.1	6.9
Stoneham,	.	10.20	Separate,	.	211	4.7	992	6,770	0.66	5.50	14.7	10.0
Arlington,	.	16.52	Separate,	.	445	5.5	3,000	7,750	1.55	5.20	38.6	29.8
Belmont,	.	5.60	Separate,	.	145	6.4	1,328	3,770	0.74	4.66	36.2	15.9
Wakefield,**	.	-	-	-	-	-	-	750	-	0.95	-	-
Lexington,**	.	-	-	-	-	-	-	2,750	-	6.11	-	-
Total,	.	436.89	-	-	45,098	6.6	294,180	422,390	22.66	77.88	70.1	20.1

* Estimated from assessors' statement of the number of houses in each city or town, and the population from census of 1895 extended to 1900.
† Estimated by Superintendent J. R. Gerrish of the Institution on Deer Island.
‡ The Pearl street district of Chelsea temporarily excluded, owing to connection not being properly maintained.
§ Including 30 persons at navy yard.
Including 2 connections with McLean Hospital, having an estimated population of 400.
** Exclusive of Mystic valley sewer and tanneries.
†† Lexington not connected.

*Concord, Boston and Andover*

2.24

77) 62 (80

1.61	2.12
3.34	1.27
5.07	6.11
3.79	3.96
8.35	
5.95	
12.70	
6.54	
5.89	
4.66	
.95	
	13.52
	6.11
	62.17

## CHARLES RIVER VALLEY SYSTEM.

Table showing Cities and Towns delivering Sewage to this System; Approximate Miles of Sewer connected; Estimated Populations and Areas now contributing; Total Areas ultimately to contribute, and Present Populations on Slight Areas; Ratios of Present Contributing Areas to Ultimate Areas, and Ratios of Populations now contributing to Present Total Populations.

CITIES AND TOWNS.	Miles of Local Sewers.	Number of Connected Houses with Local Sewers.	Estimated Number of Persons served by Beach House connection.*	Estimated Number of Persons served by Beach House connection.	Total Population.	Estimated Present Population.	Estimated Area now contributing sewage.	Area ultimately contributing sewage.	Ratio of Contributing Areas to Ultimate Areas.	Ratio of Contributing Populations to Ultimate Populations.	Square Miles.	Per Cent. of County population.	Per Cent. of County area.
Part of Boston (proper),	16.90	Separate and combined,	2,610	5.8	14,588	16,340	1.10	1.68	1.10	96.0†	1.68	96.5	70.7
Boston (Brighton),	47.19	Separate and combined,	2,200	5.8	12,760	18,600	3.02	4.27	4.27	68.5	4.27	68.1	60.1
Brookline,	48.00‡	Combined,	2,215	6.6	14,619	19,410	2.91	4.84	4.84	75.3	4.84	75.3	43.8
Newton,	84.96	Separate,	3,770	5.3	19,981	31,729	5.95	13.60	13.60	63.0	13.60	63.0	39.9
Watertown,	23.50	Separate,	1,175	6.4	7,520	9,000	1.61	4.04	4.04	83.6	4.04	83.6	17.6
Waltham,	39.81	Separate,	2,696	6.2	19,850§	28,040	2.40	13.68	13.68	86.1	13.68	86.1	40.4
Total,	260.36	-	14,666	6.1	89,288	117,190	16.99	42.06	42.06	76.2	42.06	76.2	40.4

\* Estimated from assessors' statement of the number of houses in each city or town, and the population from census of 1895 extended to 1899.

† Over-estimated in two last reports.

‡ Estimated by city sewer department.

§ Estimated by city engineer.

## NEPONSET VALLEY SYSTEM.

*Table showing Cities and Towns delivering Sewage to this System; Approximate Miles of Sewer connected; Estimated Populations and Areas now contributing; Total Areas ultimately to contribute, and Present Populations on Such Areas; Ratios of Present Contributing Areas to Ultimate Areas, and Ratios of Populations now contributing to Present Total Populations.*

CITIES AND TOWNS.	MILES OF LOCAL SEWER CONNECTIONS.	BEPARATE AND COMBINED.	NUMBER OF CONNECTIONS WITH LOCAL SEWERS.	ESTIMATED NUMBER OF PERSONS SERVED BY EACH HOUSE.	ESTIMATED POPULATION NOW CONTRIBUTING.	TOTAL POPULATION PRESENT.	ESTIMATED AREA NOW CONTRIBUTING SEWAGE.	AREAS ULTIMATELY TO SEWAGE.	RATIO OF CONTRIB. AREAS TO PRESENT TOTAL POPULATION.	ULTIMATE AREA.	PER CENT. OF CONTRIB. AREAS.
Boston (Dorchester),	11.73	Separate and combined.	901	6.3	5,676	11,300	Square Miles. 0.76	Square Miles. 2.59	Per Cent. 50.0	Per Cent. 29.0	
Milton,	2.96	Separate and combined.	47	5.3	249	3,850	0.15	12.59	6.45	1.2	
Hyde Park,	12.18	Separate,	287	7.7	2,209	13,346	0.71	4.67	16.2	16.6	
Dedham,	-	-	-	-	-	7,200	-	14.10	-	-	
Boston (West Roxbury),	2.46	Separate,	56	6.4	558	1,900	0.17	4.02	34.0	4.2	
Brookline,	-	-	-	-	-	400	-	1.97	-	-	
Newton,	-	-	-	-	-	400	-	4.43	-	-	
Total,	29.32	-	1,291	6.7	8,692	38,896	1.79	44.27	22.6	4.05	

\* Estimated by local engineers.

## WHOLE METROPOLITAN SYSTEM.

Table showing Areas delivering Sewage to the Entire System, exclusive of added High-level Area; Approximate Miles of Sewer connected; Estimated Populations and Areas now contributing; Total Areas ultimately to contribute, and Present Populations on Such Areas; Ratios of Present Contributing Areas to Ultimate Areas, and Ratios of Populations now contributing to Present Total Populations.

SYSTEM.	Miles of Local Sewer connected. Separate or Comm.-	Number of connections with Local Sewers.	Estimated Number of Persons served by Each House-connection.	Estimated Population now contributing. Urban Sewage.	Total Population estimated Present.	Estimated Area now contributing Sewage.	Area ultimately to contribute Sewage.	Ratio of Contributing Population to Present Total Population.	Ultimate Area. Square Miles.	Square Miles.	Per Cent.	Per Cent.
North Metropolitan, .	456.89	Separate and Combined	45,008	6.6	296,190	422,860	22.66	77.93	70.1	29.1		
Charles River valley, .	260.36	Separate and Combined	14,568	6.1	89,288	117,120	16.90	42.06	76.2	40.4		
Neponset River valley, .	20.32	Separate and Combined	1,291	6.7	8,092	38,990	1.70	44.27	22.6	4.06		
Total, . . .	726.57	-	60,865	6.5	384,180	573,176	41.44	164.26	65.2	26.2		

The four pumping stations of the North Metropolitan system have been in continuous operation during the year. The pumping plants and buildings are in excellent condition. The records of the quantities pumped and other data relating to the work of the stations are given below:—

#### DEER ISLAND PUMPING STATION.

At this station are two submerged centrifugal pumps, with impellers or wheels 8.25 feet in diameter driven by triple-expansion engines of the Reynolds-Corliess type.

Contract capacity of pumps: 45,000,000 gallons each, with 19-foot lift.

Average duty for the year: 55,600,000 foot-pounds.

Average quantity raised each day: 47,600,000 gallons.

Force employed: 3 engineers, 3 firemen, 4 screenmen and 1 reliefman.

Coal used: first-quality Cumberland, costing from \$2.67 to \$3.35 per ton.

The additional plant, which is now being erected, is to consist of one engine and pump of the same type and capacity as each of the above, with the necessary boilers, piping, etc., representing an addition of 50 per cent. to the present capacity.

*Table of Approximate Quantities, Lifts and Duties at the Deer Island Pumping Station of the North Metropolitan System.*

MONTHS.	Total Pumpage (Gallons).	Average per Day (Gallons).	Minimum Day (Gallons).	Maximum Day (Gallons).	Average Lift (Feet).	Average Duty (Million ft.-lbs. per 100 lbs. Coal).
<b>1898-99.</b>						
October, .	1,371,000,000	44,200,000	34,600,000	74,700,000	9.99	57,700,000
November, .	1,438,500,000	47,900,000	38,600,000	67,700,000	10.66	59,600,000
December, .	1,626,400,000	52,500,000	43,800,000	75,900,000	11.06	56,800,000
January, .	1,832,300,000	59,100,000	45,900,000	85,700,000	11.51	59,500,000
February, .	1,576,200,000	56,300,000	42,400,000	85,700,000	11.58	53,700,000
March, .	2,120,700,000	68,400,000	51,000,000	86,800,000	12.46	63,600,000
April, .	1,477,500,000	49,200,000	38,100,000	75,100,000	11.33	55,300,000
May, .	1,239,600,000	40,000,000	35,500,000	44,800,000	12.48	53,000,000
June, .	1,142,600,000	38,100,000	32,300,000	59,100,000	12.38	46,300,000
July, .	1,171,700,000	37,800,000	30,600,000	56,300,000	12.00	48,500,000
August, .	1,175,700,000	38,200,000	31,000,000	47,300,000	11.20	55,800,000
September, .	1,184,000,000	39,500,000	27,900,000	67,100,000	11.25	57,700,000
<b>Total, .</b>	<b>17,356,200,000</b>	<b>—</b>	<b>—</b>	<b>—</b>	<b>—</b>	<b>—</b>
<b>Average,</b>	<b>—</b>	<b>47,600,000</b>	<b>37,600,000</b>	<b>68,800,000</b>	<b>11.50</b>	<b>55,600,000</b>

## EAST BOSTON PUMPING STATION.

At this station are two submerged centrifugal pumps, with impellers or wheels 8.25 feet in diameter, driven by triple-expansion engines of the Reynolds-Corliss type.

Contract capacity of pumps: 45,000,000 gallons each, with 19-foot lift.

Average duty for the year: 54,600,000 foot-pounds.

Average quantity raised each day: 46,200,000 gallons.

Force employed: 3 engineers, 3 firemen, 4 screenmen and 1 reliefman.

Coal used: first-quality Cumberland, costing from \$2.79 to \$3.60 per ton.

The additional plant, now being erected, is to consist of one engine and pump of the same type and capacity as each of the above, with the necessary boilers, piping, etc., representing an addition of 50 per cent. to the existing capacity.

*Table of Approximate Quantities, Lifts and Duties at the East Boston Pumping Station of the North Metropolitan System.*

MONTHS.	Total Pumpage (Gallons).	Average per Day (Gallons).	Minimum Day (Gallons).	Maximum Day (Gallons).	Average Lift (Feet).	Average Duty (Million ft.-lbs. per 100 lbs. Coal).
<b>1898-99.</b>						
October, .	1,292,500,000	41,700,000	30,000,000	68,100,000	15.20	53,800,000
November, .	1,378,200,000	45,900,000	34,900,000	62,800,000	15.49	54,800,000
December, .	1,610,100,000	51,900,000	41,300,000	75,300,000	15.66	57,800,000
January, .	1,805,900,000	58,300,000	45,200,000	77,500,000	15.79	58,300,000
February, .	1,522,700,000	54,400,000	41,000,000	78,600,000	15.47	59,500,000
March, .	2,065,800,000	66,600,000	47,000,000	82,800,000	15.79	56,500,000
April, .	1,412,800,000	47,100,000	36,800,000	68,700,000	17.44	44,700,000
May, .	1,168,500,000	37,700,000	32,300,000	46,400,000	14.93	52,800,000
June, .	1,197,800,000	39,900,000	32,500,000	48,800,000	14.80	55,500,000
July, .	1,144,100,000	36,900,000	31,700,000	51,800,000	15.02	51,200,000
August, .	1,165,000,000	37,500,000	34,000,000	47,300,000	14.48	56,800,000
September, .	1,115,400,000	37,200,000	27,800,000	59,500,000	14.78	53,800,000
Total, .	16,878,600,000	-	-	-	-	-
Average,	-	46,200,000	36,200,000	68,800,000	15.40	54,800,000

## CHARLESTOWN PUMPING STATION.

At this station are two submerged centrifugal pumps, with impellers or wheels 7.5 feet in diameter, driven by triple-expansion engines of the Reynolds-Corliss type.

Contract capacity of pumps: 22,000,000 gallons each, with 11-foot lift.

Average duty for the year: 60,800,000 foot-pounds.

Average quantity raised each day: 28,000,000 gallons.

Force employed: 3 engineers, 3 firemen, 4 screenmen and 1 reliefman.

Coal used: first-quality Cumberland costing from \$2.84 to \$3.60 per ton.

The additional plant, which is now practically completed, is to consist of one engine and pump of the same type as each of the above, but of larger dimensions and capacity, the pump wheel being 8.25 feet in diameter. The effect of the new installation, including boilers, etc., will be to double the present capacity of this station.

*Table of Approximate Quantities, Lifts and Duties at the Charlestown Pumping Station of the North Metropolitan System.*

MONTHS.	Total Pumpage (Gallons).	Average per Day (Gallons).	Minimum Day (Gallons).	Maximum Day (Gallons).	Average Lift (Feet).	Average Duty (Million ft.-lbs. per 100 lbs. Coal).
<b>1898-99.</b>						
October, .	780,000,000	25,200,000	19,100,000	39,200,000	7.81	59,400,000
November, .	786,400,000	26,200,000	17,100,000	37,700,000	7.87	60,700,000
December, .	907,300,000	29,300,000	23,300,000	43,900,000	8.33	64,600,000
January, .	1,027,600,000	38,100,000	24,300,000	46,900,000	8.39	64,300,000
February, .	914,000,000	32,600,000	25,400,000	49,800,000	8.75	66,500,000
March, .	1,181,000,000	38,100,000	25,600,000	48,900,000	9.08	66,700,000
April, .	789,800,000	26,300,000	20,100,000	89,500,000	8.83	56,500,000
May, .	753,700,000	24,300,000	21,600,000	29,800,000	8.65	56,400,000
June, .	803,200,000	26,800,000	21,000,000	35,200,000	8.64	65,500,000
July, .	761,000,000	24,500,000	20,400,000	32,200,000	8.93	56,500,000
August, .	747,300,000	24,100,000	16,900,000	30,600,000	8.89	53,300,000
September, .	762,600,000	25,400,000	17,900,000	36,000,000	8.90	60,000,000
Total, .	10,213,900,000	-	-	-	-	-
Average,	-	28,000,000	21,000,000	39,100,000	8.60	60,800,000

## ALEWIFE BROOK PUMPING STATION.

The plant consists of small commercial pumps and engines, two 9-inch Andrews vertical centrifugal pumps, with direct-connected compound marine engines.

Capacity of pumps: 4,500,000 gallons each, with 13-foot lift.

Average duty for the year: 14,300,000 foot-pounds.

Average quantity raised each day: 3,500,000 gallons.

Force employed: the normal force of two engineers, working twelve-hour shifts each, has been augmented by one man during the installation of additional plant, described on page 14.

Coal used: first-quality Cumberland, costing from \$3.09 to \$4 per ton.

The additional plant installed at this station during the year has a contract capacity of 13,000,000 gallons per day, raised to an elevation of 13 feet above the level of the sewage in the pump well. It is more fully described in this report under the constructional work of the year.

*Table of Approximate Quantities, Lifts and Duties at the Alewife Brook Pumping Station of the North Metropolitan System.*

MONTHS.	Total Pumpage (Gallons).	Average per Day (Gallons).	Minimum Day (Gallons).	Maximum Day (Gallons).	Average Lift (Feet).	Average Duty (Million ft.-lbs. per 100 lbs. Coal).
<b>1898-99.</b>						
October, .	92,314,000	2,978,000	1,952,000	5,170,000	13.24	14,100,000
November, .	107,457,000	3,582,000	2,550,000	4,738,000	12.81	15,200,000
December, .	137,653,000	4,440,000	3,478,000	6,335,000	12.90	17,500,000
January, .	165,055,000	5,324,000	4,027,000	6,872,000	18.05	17,600,000
February, .	135,100,000	4,822,000	3,478,000	6,577,000	12.93	16,100,000
March, .	176,479,000	5,693,000	4,860,000	6,990,000	12.83	15,500,000
April, .	111,223,000	3,707,000	2,881,000	5,494,000	12.92	14,300,000
May, .	85,727,000	2,765,000	1,742,000	4,818,000	13.46	14,200,000
June, .	72,453,000	2,415,000	1,580,000	3,718,000	13.41	12,100,000
July, .	66,523,000	2,146,000	1,438,000	4,677,000	13.35	12,000,000
August, .	62,477,000	2,015,000	1,402,000	5,106,000	13.44	11,400,000
September, .	63,747,000	2,125,000	1,260,000	4,493,000	13.37	11,800,000
Total, .	1,276,208,000	-	-	-	-	-
Average,	-	3,501,000	2,554,000	5,374,000	13.14	14,300,000

In the following tables the average cost of pumping during the year at each of the four pumping stations is given in detail, and compared with the corresponding figures in each case for the preceding year:—

*Average Cost per Million Foot-gallons for Pumping at the Deer Island Station.*

Annual Volume (17,356 Million Gallons)  $\times$  Lift (11.5 Feet) = 199,594 Million Foot-gallons.

ITEMS.	Cost.	Cost per Million Foot-gallons.	Cost per Million Foot-gallons in the Previous Year.
Labor, . . . . . . . .	\$7,603 69	\$0.03810*	\$0.04400
Coal, . . . . . . . .	8,964 37	.01986	.01950
Oil, . . . . . . . .	308 54	.00152	.00190
Waste, . . . . . . . .	30 82	.00015	.00025
Water, . . . . . . . .	882 60	.00442	.00330
Packing, . . . . . . . .	99 01	.00050	.00115
Miscellaneous supplies and renewals, . . . . . . . .	618 43	.00307	.00700
Total, . . . . . . . .	\$18,497 46	\$0.06762	\$0.07710

\* Includes labor at screens; deducting this item gives cost of labor \$0.03002. Deducting labor at screens gives cost of pumping \$0.06954.

*Average Cost per Million Foot-gallons for Pumping at the East Boston Station.*

Annual Volume (16,879 Million Gallons)  $\times$  Lift (15.4 Feet) = 259,936 Million Foot-gallons.

ITEMS.	Cost.	Cost per Million Foot-gallons.	Cost per Million Foot-gallons in the Previous Year.
Labor, . . . . . . . .	\$7,776 69	\$0.02992*	\$0.03440
Coal, . . . . . . . .	5,964 83	.02294	.02170
Oil, . . . . . . . .	231 69	.00089	.00180
Waste, . . . . . . . .	41 80	.00016	.00020
Water, . . . . . . . .	940 80	.00362	.00380
Packing, . . . . . . . .	30 02	.00012	.00010
Miscellaneous supplies and renewals, . . . . . . . .	541 06	.00208	.00530
Total, . . . . . . . .	\$15,526 88	\$0.05978	\$0.06680

\* Includes labor at screens; deducting this item gives cost of labor \$0.02290. Deducting labor at screens gives cost of pumping \$0.05271.

*Average Cost per Million Foot-gallons for Pumping at the Charlestown Station.*

Annual Volume (10,214 Million Gallons)  $\times$  Lift (8.6 feet) = 87,840 Million Foot-gallons.

ITEMS.	Cost.	Cost per Million Foot-gallons.	Cost per Million Foot-gallons in the Previous Year.
Labor, . . . . . . . .	\$7,292 57	\$0.06302	\$0.09330
Coal, . . . . . . . .	1,994 18	.02270	.02080
Oil, . . . . . . . .	344 95	.00393	.00530
Waste, . . . . . . . .	45 48	.00052	.00074
Water, . . . . . . . .	327 25	.00378	.00370
Packing, . . . . . . . .	100 00	.00114	.00110
Miscellaneous supplies and renewals, . . . . . . . .	274 35	.00312	.01020
Total, . . . . . . . .	\$10,878 78	\$0.11816	\$0.13464

*Average Cost per Million Foot-gallons for Pumping at the Alewife Brook Station.*

Annual Volume (1,276 Million Gallons)  $\times$  Lift (18.14 feet) = 16,767 Million Foot-gallons.

ITEMS.	Cost.	Cost per Million Foot-gallons.	Cost per Million Foot-gallons in the Previous Year.
Labor, . . . . . . . . . .	\$2,703 00	.0016122	.0015810
Coal, . . . . . . . . . .	1,591 64	.00493	.00430
Oil, . . . . . . . . . .	223 15	.01331	.01150
Waste, . . . . . . . . . .	18 34	.00109	.00126
Water, . . . . . . . . . .	254 86	.01520	.01380
Packing, . . . . . . . . . .	20 60	.00123	.00197
Miscellaneous supplies and renewals, . . . . .	72 50	.00432	.00888
Total, . . . . . . . . . .	\$4,584 18	.0029130	.0027931

The tables show that, as compared with the previous year, substantial reductions in the cost of pumping per million foot-gallons have been effected at the three large stations. The increase of 4.3 per cent. in this item at the Alewife Brook station is due partly to the interruption of the ordinary service (involving extra labor) during construction of extensions and installation of additional plant, and partly to the consumption of coal and oil for engine trials. Apart from this, the rate has been reduced 12.3 per cent. at Deer Island, 10.6 per cent. at East Boston and 12.2 per cent. at Charlestown. This is equivalent to an average reduction in the rate per million-foot gallons of 11.6 per cent. for the three large stations, or of 10.7 per cent., including Alewife Brook

#### MATERIAL INTERCEPTED AT THE SCREENS.

The sewage is passed through cages or screens before it reaches the pumps at the three large stations. The screens are hung in the lower sewer, so that they can be raised or lowered by steam power, and are set in pairs, one before the other.

The total quantity intercepted at the screens during the year ending Sept. 30, 1899, was about 1,000 cubic yards, or about 1.6 cubic feet per million gallons pumped at Deer Island.

#### CARE OF SEWERS AND SPECIAL STRUCTURES.

The 70 miles of metropolitan sewers are maintained by a permanent force of 1 foreman, 6 assistant foremen and 18 laborers, with 5 horses and carts. They inspect at regular intervals the regulating valves at the public connections, flush and clean the

sewers in special cases, remove ashes and screenings from the stations, clean sand-catchers and flush siphons as needed, and maintain a ferry at Shirley Gut.

The total expenditure on account of this force for the year has been as follows:—

North Metropolitan system,	.	.	.	.	.	.	.	.	.	\$23,417 05
Charles River system,	.	:	:	:	:	:	:	:	:	1,792 40
Neponset valley system,	.	.	.	.	.	.	.	.	.	2,151 94
										\$27,361 39

The metropolitan sewers are in good condition throughout. It is found that, with the exception of the solids intercepted at the screens, practically no deposits require removal from the main sewers or from the siphons, indicating that the velocities maintained in the sewers and siphons are sufficient to carry suspended matters to the outfall. This conclusion is confirmed by the observations, periodically made, as to losses of head at the siphons, which continue to yield no evidence of appreciable deposits.

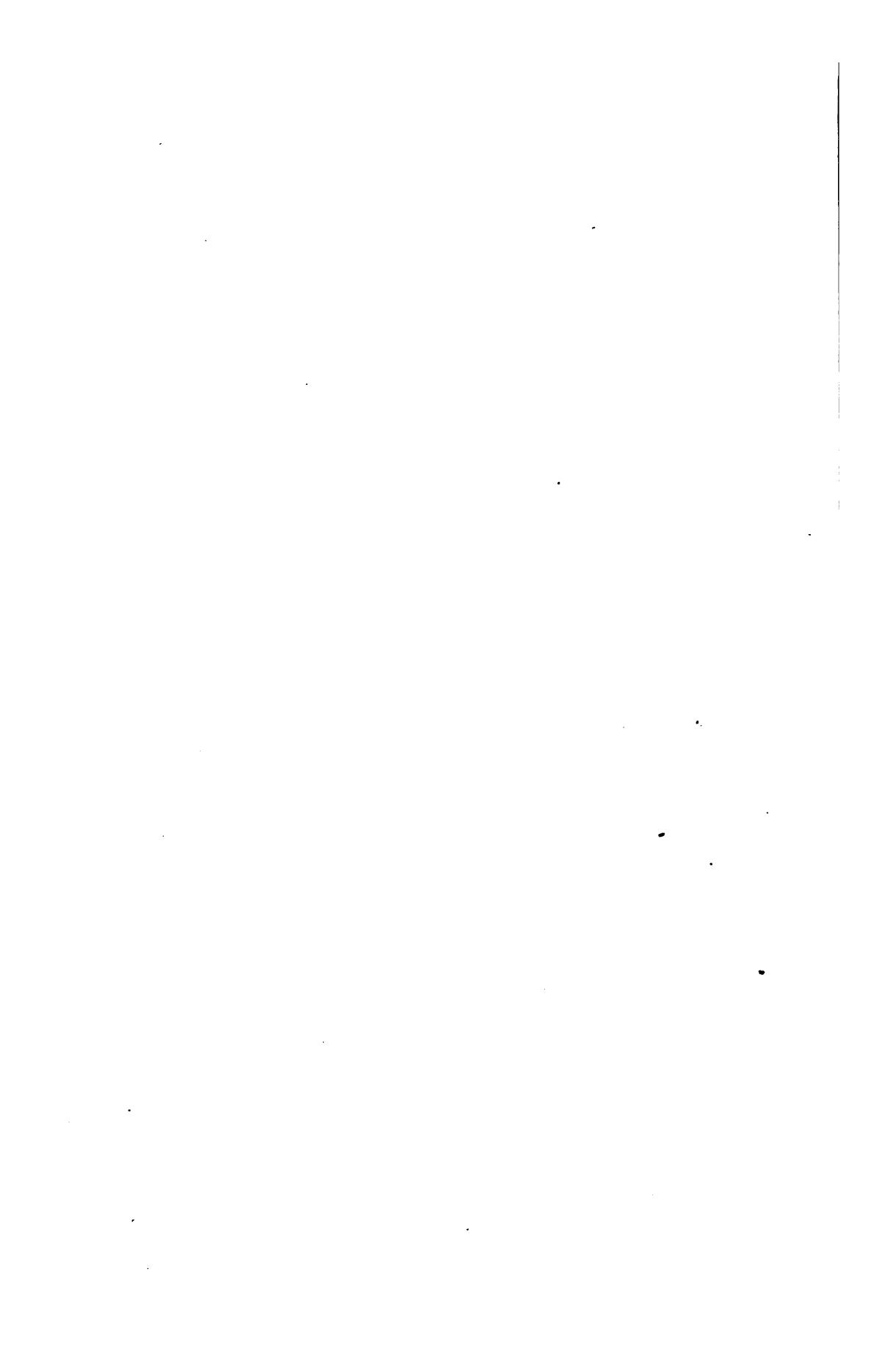
The outfall sewer and works remain in satisfactory condition.

#### ENGINEERING STUDIES AND SUPPLIES.

The usual detailed studies of the engine records have been made. The necessary engineering supervision of day work on pumping plant extensions has been furnished. Studies of suggested extensions of the metropolitan sewers to provide additional connections for Everett and Wakefield have been made during the year. The above, with clerical services, office supplies, and maintenance of the office building, No. 1 Mt. Vernon Street, have cost for the year \$7,018.61.

Respectfully submitted,

WILLIAM M. BROWN, JR.,  
*Chief Engineer and Superintendent.*



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## **APPENDIX.**

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TABLE A.—MISCELLANEOUS BIDS UPON THE NORTH METROPOLITAN SEWERAGE SYSTEM.

NAME OF BIDDER.	ADDRESS.	GRAVEL.		LUMBER.		SAND.	
		DEER ISLAND.	EAST BOSTON.	DEER ISLAND.	EAST BOSTON.	EAST BOSTON.	DEER ISLAND.
		Bids opened March 11, 1889.					
Christian Peterson,	Boston, Mass.,	\$0 95*	\$1 00	—	—	—	—
P. O'Riorden,	Boston, Mass.,	1 22	1 28	—	—	—	—
Massachusetts Broken Stone Co.,	Boston, Mass.,	1 45	1 30*	—	—	—	—
John W. Leatherbee,	Boston, Mass.,	1 86*	1 90*	—	—	—	—
Andrew F. Leatherbee,	Boston, Mass.,	—	—	—	—	—	—
T. H. Buck & Co.,	Chelsea, Mass.,	—	—	—	—	—	—
Waldo Bros.,	Boston, Mass.,	—	—	—	—	—	—
H. & D. Burnett,	Boston, Mass.,	—	—	—	—	—	—
Ham & Carter,	Boston, Mass.,	—	—	—	—	—	—
Parry Bros. & Co.,	Boston, Mass.,	—	—	—	—	—	—
Chas. R. Stone Co.,	Boston, Mass.,	—	—	—	—	—	—
S. & R. J. Lombard,	Charlestown, Mass.,	—	—	—	—	—	—
Walter S. Lyons,	Boston, Mass.,	—	—	—	—	—	—
Henry T. Woods,	Boston, Mass.,	—	—	—	—	—	—
Metropolitan Coal Co.,	Boston, Mass.,	—	—	—	—	—	—
Chesapeake & Ohio Coal Agency,	Boston, Mass.,	—	—	—	—	—	—
Wellington-Wild Coal Co.,	Boston, Mass.,	—	—	—	—	—	—
Curran & Burton,	Boston, Mass.,	—	—	—	—	—	—

• Contract awarded to.

† Per ton.

‡ Per cubic yard.

\* Per 1,000 feet.

TABLE A — MISCELLANEOUS BIDS UPON THE NORTH METROPOLITAN SEWERAGE SYSTEM — *Continued.*

NAME OF BIDDER.	ADDRESS.	BROKEN STONE.		CEMENT.		BRICK.	
		EAST BOSTON.	DEER ISLAND.	EAST BOSTON.	DEER ISLAND.	EAST BOSTON.	DEER ISLAND.
Christian Peterson,	Boston, Mass.,	-	-	\$1 45 <sup>1</sup>	~	-	-
P. O'Riordan,	Boston, Mass.,	~	\$1 78 <sup>3</sup>	1 86 <sup>3</sup>	-	-	-
Massachusetts Broken Stone Co.,	Boston, Mass.,	~	~	-	-	-	-
John W. Leatherbee,	Boston, Mass.,	-	-	-	-	-	-
Andrew F. Leatherbee,	Boston, Mass.,	-	-	-	-	-	-
T. H. Buck & Co.,	Chelsea, Mass.,	-	-	-	-	-	-
Waldo Bros.,	Boston, Mass.,	-	-	-	-	-	-
H. & D. Burnett,	Boston, Mass.,	1 69 <sup>4</sup>	-	-	-	-	-
Ham & Carrier,	Boston, Mass.,	-	-	-	-	-	-
Parry Bros. & Co.,	Boston, Mass.,	-	-	-	-	-	-
Chas. R. Stone Co.,	Boston, Mass.,	-	-	-	-	-	-
S. & R. J. Lombard,	Charlestown, Mass.,	-	-	-	-	-	-
Walter S. Lyons,	Boston, Mass.,	-	-	-	-	-	-
Henry T. Woods,	Boston, Mass.,	-	-	-	-	-	-
Metropolitan Coal Co.,	Boston, Mass.,	-	-	-	-	-	-
Chesapeake & Ohio Coal Agency,	Boston, Mass.,	-	-	-	-	-	-
Wellington-Wild Coal Co.,	Boston, Mass.,	-	-	-	-	-	-
Curran & Burton,	Boston, Mass.,	-	-	-	-	-	-

\* Contract awarded to.

† Per ton.

‡ Per cubic yard.

§ Brooks Shoobridge.

¶ Atlas American.

\*\* Alsen.

\*\*\* Per 1,000.

## METROPOLITAN SEWERAGE.

[Jan.]

TABLE A.—MISCELLANEOUS BIDS UPON THE NORTH METROPOLITAN SEWERAGE SYSTEM—Continued.

NAME OF BIDDER.	ADDRESS.	CUT STONE.		COAL.	
		EAST BOSTON.	DEER ISLAND.	CHARLESTOWN PUMPING STATION.	DEER ISLAND PUMPING STATION.
		Bids opened March 11, 1889.	Bids opened March 11, 1889.	Bids opened Oct. 8, 1888.	Bids opened Oct. 8, 1888.
Christian Peterson,	Boston, Mass.,	-	-	-	-
P. O'Riordan,	Boston, Mass.,	-	-	-	-
Massachusetts Broken Stone Co.,	Boston, Mass.,	-	-	-	-
John W. Leathertree,	Boston, Mass.,	-	-	-	-
Andrew F. Leatherbee,	Boston, Mass.,	-	-	-	-
T. H. Buck & Co.,	Chelsea, Mass.,	-	-	-	-
Waldo Bros.,	Boston, Mass.,	-	-	-	-
H. & D. Burnett,	Boston, Mass.,	-	-	-	-
Ham & Carter,	Boston, Mass.,	-	-	-	-
Parry Bros. & Co.,	Boston, Mass.,	\$3,067 00 <sup>1</sup>	842 50	\$842 50	\$2 67 <sup>2*</sup>
Chas. R. Stone Co.,	Boston, Mass.,	-	-	717 00*	2 84 <sup>3</sup>
S. & R. J. Lombard,	Charlestown, Mass.,	-	-	-	2 78 <sup>3</sup>
Walter S. Lyons,	Boston, Mass.,	-	-	-	-
Henry T. Woods,	Boston, Mass.,	-	-	-	-
Metropolitan Coal Co.,	Boston, Mass.,	-	-	-	-
Chesapeake & Ohio Coal Agency,	Boston, Mass.,	-	-	-	-
Wellington-Wild Coal Co.,	Boston, Mass.,	-	-	-	-
Curran & Burton,	Boston, Mass.,	-	-	-	-

\* Contract awarded to.

<sup>1</sup> As per plan, including bid on both stations.<sup>2</sup> Per ton.

TABLE A.—MISCELLANEOUS BIDS UPON THE NORTH METROPOLITAN SEWERAGE SYSTEM—Concluded.

NAME OF BIDDER.	ADDRESS.	COAL.				Coal.	
		CHARLESTOWN PUMPING STATION	EAST BOSTON PUMPING STATION	DEER ISLAND PUMPING STATION	CHARLESTOWN PUMPING STATION		
Christian Peterson, P. O'Riordan, Massachusetts Broken Stone Co.,	Boston, Mass., Boston, Mass.,	-	-	-	-	-	
John W. Leatherbee, Andrew F. Leatherbee, T. H. Buck & Co.,	Boston, Mass., Boston, Mass., Boston, Mass.,	-	-	-	-	-	
Waldo Bros.,	Boston, Mass.,	-	-	-	-	-	
H. & D. Burnett, Ham & Carter,	Boston, Mass., Boston, Mass.,	-	-	-	-	-	
Parry Bros. & Co., Chas. R. Stone Co., S. & R. J. Lombard,	Boston, Mass., Boston, Mass., Charlestown, Mass.,	-	-	-	-	-	
Walter S. Lyons, Henry T. Woods, Metropolitan Coal Co.,	Boston, Mass., Boston, Mass., Boston, Mass.,	\$3 86 <sup>1</sup> \$3 60*	\$3 86 <sup>1</sup> \$3 60*	\$3 06 <sup>1</sup> \$2 85*	\$3 16 <sup>1</sup> \$2 85*	\$3 01 <sup>1</sup> \$2 85*	
Chesapeake & Ohio Coal Agency, Wellington-Wild Coal Co.,	Boston, Mass., Boston, Mass.,	-	-	-	-	-	
Curran & Burton.,	Boston, Mass.,	3 80 <sup>1</sup> -	3 24 <sup>1</sup> -	3 24 <sup>1</sup> -	3 24 <sup>1</sup> -	3 25 <sup>1</sup> 3 16 <sup>1</sup>	

\* Contract awarded to.

1 Per ton.

TABLE B.—BIDS FOR UNDERDRAIN TO BE USED ON HIGH-LEVEL SEWER.

NAME OF BIDDER.	ADDRESS.	
Curtis & Pope Lumber Co.,	Boston, Mass.,	72½ per cent. discount.*
Waldo Bros.,	Boston, Mass.,	63 per cent. discount.
W. G. Nash,	Boston, Mass.,	63 per cent discount.
Dorchester Building Material Co.,	Boston, Mass.,	63 per cent. discount.
Portland Stone Ware Co.,	Boston, Mass.,	63 per cent. discount.
Berry & Ferguson,	Boston, Mass.,	63 per cent. discount.
		{ 3,000 feet 4-inch drain at 6 cents per foot.
		{ 3,000 feet 6-inch drain at 9 cents per foot.
		{ 4,000 feet 8-inch drain at 13 cents per foot.
		{ 1,000 feet 10-inch drain at 19 cents per foot.
		{ 1,000 feet 12-inch drain at 25 cents per foot.
W. S. Mitchell,	Boston, Mass.,	

\* Contract awarded.

TABLE C.—MAINTAINING AND OPERATING THE NORTH METROPOLITAN SYSTEM.

		<b>1898.</b>		
Oct.	31.	By supplies for month, general, . .	\$2,277 81	
		By pay rolls for month, general, . .	1,400 20	
		By pay rolls for month, Deer Island,	821 64	
		By pay rolls for month, East Boston,	599 87	
		By pay rolls for month, Charlestown,	773 22	
		By pay rolls for month, Alewife Brook, . . . . .	85 68	
	31.	By proportionate expenses, commissioners, chief engineer, clerk and others, for month, . . . . .	850 80	
				<b>\$6,809 22</b>
Nov.	30.	By supplies for month, general, . .	\$1,094 64	
		By pay rolls for month, general, . .	1,756 08	
		By pay rolls for month, Deer Island,	547 76	
		By pay rolls for month, East Boston,	593 78	
		By pay rolls for month, Charlestown,	562 56	
		By pay rolls for month, Alewife Brook, . . . . .	284 88	
	30.	By proportionate expenses, commissioners, chief engineer, clerk and others, for month, . . . . .	750 00	
				5,589 65
Dec.	31.	By supplies for month, general, . .	\$3,743 90	
		By pay rolls for month, general, . .	1,102 25	
		By pay rolls for month, Deer Island,	300 57	
		By pay rolls for month, East Boston,	596 74	
		By pay rolls for month, Charlestown,	561 64	
		By pay rolls for month, Alewife Brook, . . . . .	295 42	
				6,600 52
		<b>1899.</b>		
Jan.	31.	By supplies for month, general, . .	\$2,952 88	
		By pay rolls for month, general, . .	2,286 67	
		By pay rolls for month, Deer Island,	842 76	
		By pay rolls for month, East Boston,	593 46	
		By pay rolls for month, Charlestown,	561 64	
		By pay rolls for month, Alewife Brook, . . . . .	256 80	
				7,494 21
Feb.	28.	By supplies for month, general, . .	\$45 10	
		By pay rolls for month, general, . .	1,079 50	
		By pay rolls for month, Deer Island,	277 18	
		By pay rolls for month, East Boston,	317 40	
		By pay rolls for month, Charlestown,	280 82	
				2,000 00
March	31.	By supplies for month, general, . .	\$976 72	
		By pay rolls for month, general, . .	2,094 00	
		<i>Amounts carried forward,</i>	\$3,070 72	<b>\$26,498 60</b>

TABLE C.—MAINTAINING AND OPERATING THE NORTH METROPOLITAN SYSTEM—*Continued.*

		<i>Amounts brought forward,</i>	\$3,070 72	\$26,493 60
<b>1899.</b>				
March	31,	By pay rolls for month, Deer Island,	870 48	
	31,	By pay rolls for month, East Boston,	1,207 97	
	31,	By pay rolls for month, Charlestown,	842 46	
	31,	By pay rolls for month, Alewife Brook, . . . . .	398 04	
	31,	By proportionate expenses, commis- sioners, chief engineer, clerk and others, for month, . . . . .	1,058 34	
				7,443 01
April	30,	By supplies for month, general, . . .	\$2,587 45	
	30,	By pay rolls for month, general, . . .	1,580 64	
	30,	By pay rolls for month, Deer Island,	895 34	
	30,	By pay rolls for month, East Boston,	610 59	
	30,	By pay rolls for month, Charlestown,	561 61	
	30,	By pay rolls for month, Alewife Brook, . . . . .	127 96	
	30,	By proportionate expenses, commis- sioners, chief engineer, clerk and others, for month, . . . . .	1,058 33	
				7,421 92
May	31,	By supplies for month, general, . . .	\$4,173 63	
	31,	By pay rolls for month, general, . . .	1,599 50	
	31,	By pay rolls for month, Deer Island,	598 92	
	31,	By pay rolls for month, East Boston,	297 88	
	31,	By pay rolls for month, Charlestown,	842 46	
	31,	By pay rolls for month, Alewife Brook, . . . . .	871 44	
	31,	By proportionate expenses, commis- sioners, chief engineer, clerk and others, for month, . . . . .	1,058 33	
				8,937 16
June	30,	By supplies for month, general, . . .	\$4,623 76	
	30,	By pay rolls for month, general, . . .	1,662 00	
	30,	By pay rolls for month, Deer Island,	598 92	
	30,	By pay rolls for month, East Boston,	890 98	
	30,	By pay rolls for month, Charlestown,	561 64	
	30,	By pay rolls for month, Alewife Brook, . . . . .	123 25	
	30,	By proportionate expenses, commis- sioners, chief engineer, clerk and others, for month, . . . . .	1,058 34	
				9,513 89
July	31,	By supplies for month, general, . . .	\$3,467 55	
	31,	By pay rolls for month, general, . . .	2,065 34	
	31,	By pay rolls for month, Deer Island,	1,196 19	
	31,	By pay rolls for month, East Boston,	593 79	
		<i>Amounts carried forward,</i>	\$7,322 87	\$59,809 58

TABLE C.—MAINTAINING AND OPERATING THE NORTH METROPOLITAN SYSTEM—*Concluded.*

		<i>Amounts brought forward,</i>	\$7,322 87	\$59,809 58
<b>1899.</b> July 31,	By pay rolls for month, Charlestown,	561 64		
	By pay rolls for month, Alewife Brook, . . . . .	331 01		8,215 52
Aug. 31,	By pay rolls for month, general,	\$1,826 89		
31,	By pay rolls for month, Deer Island,	599 56		
31,	By pay rolls for month, East Boston,	604 00		
31,	By pay rolls for month, Charlestown,	842 46		
31,	By pay rolls for month, Alewife Brook, . . . . .	314 84		4,187 75
Sept. 30,	By supplies for month, general, . . . . .	\$5,186 26		
30,	By pay rolls for month, general, . . . . .	1,347 96		
30,	By pay rolls for month, Deer Island,	292 34		
30,	By pay rolls for month, East Boston,	302 82		
30,	By pay rolls for month, Charlestown,	280 82		
30,	By pay rolls for month, Alewife Brook, . . . . .	100 13		7,510 33
				\$81,728 18

TABLE D.—MAINTAINING AND OPERATING THE CHARLES RIVER SYSTEM.

Oct. 31,	By amount paid for labor and salaries for month, . . .	\$366 06	\$366 06
Nov. 30,	By amount paid for labor and salaries for month, . . .	\$745 33	745 33
Dec. 31,	By amount paid for labor and salaries for month, . . .	\$865 68	865 68
Jan. 31,	By amount paid the city of Boston for receiving and disposing of sewage into the Boston main drainage, . . . .	\$42,375 87	42,375 87
Feb. 28,	By amount paid for labor and salaries for month, . . .	\$1,182 50	1,182 50
Mar. 31,	By amount paid for labor and salaries for month, . . .	\$208 34	208 34
April 30,	By amount paid for labor and salaries for month, . . .	\$208 33	208 33
May 31,	By amount paid for labor and salaries for month, . . .	\$247 50	247 50
July 31,	By amount paid for labor and salaries for month, . . .	\$270 00	270 00
			\$46,469 61

TABLE E.—MAINTAINING AND OPERATING THE NEPONSET VALLEY  
SYSTEM.

1898.			
Oct. 31,	By amount paid for supplies for month, . . . . .	\$119 61	
31,	By amount paid for labor and salaries for month, . . . . .	285 00	\$404 61
Nov. 30,	By amount paid for labor and salaries for month, . . . . .	\$320 33	320 33
Dec. 31,	By amount paid for labor and salaries for month, . . . . .	\$750 00	750 00
1899.			
Jan. 31,	By amount paid the city of Boston for receiving and disposing of sewage into the Boston main drainage, . . . . .	\$16,598 00	16,598 00
Feb. 28,	By amount paid for labor and salaries for month, . . . . .	\$581 66	581 66
Mar. 31,	By amount paid for labor and salaries for month, . . . . .	\$1,062 50	1,062 50
April 30,	By amount paid for labor and salaries for month, . . . . .	\$65 00	65 00
May 31,	By amount paid for labor and salaries for month, . . . . .	\$620 83	620 83
June 30,	By amount paid for labor and salaries for month, . . . . .	\$273 34	273 34
July 31,	By amount paid for labor and salaries for month, . . . . .	\$169 36	469 36
Sept. 30,	By amount paid for supplies for month, . . . . .	\$29 77	29 77
			\$21,175 40

## METROPOLITAN SEWERAGE.

[Jan.]

TABLE F.—EXPENSES OF BOARD OF METROPOLITAN SEWERAGE COMMISSIONERS FOR THE YEAR ENDING SEPT. 30, 1899.  
*North Metropolitan System.*

Lexington Branch.

## METROPOLITAN SEWERAGE.

[Jan.]

TABLE F.—EXPENSES OF BOARD OF METROPOLITAN SEWERAGE COMMISSIONERS FOR THE YEAR ENDING SEPT. 30, 1899—Continued.

*Everett Branch.*

	1898.				1899.				Totals.				
	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	
City of Malden, sewers,	\$50,096.61	-	-	-	-	-	-	-	-	-	-	-	\$50,096.61
Contract work,	-	-	\$196.00	-	-	-	-	-	-	-	-	-	196.00
Travelling expenses,	-	-	-	-	-	-	-	-	-	-	-	-	6.85
Field supplies,	-	-	-	-	-	-	-	-	-	-	-	-	85.85
Postage, telephone and telegrams,	-	-	-	-	-	-	-	-	-	-	-	-	60.60
Teaming and express,	-	-	-	-	-	-	-	-	-	-	-	-	30.30
Maps, plans and blue-prints,	-	-	-	-	-	-	-	-	-	-	-	-	1.19
Totals,	\$50,096.61	-	\$196.00	-	-	-	-	-	-	-	-	-	\$50,392.89

*Stoneham Branch.*

Field supplies,	•	•	-	-	-	-	-	-	-	-	\$6.72	\$6.72
Field supplies,	•	•	-	-	-	-	-	-	-	-	\$5.84	\$5.84

1900.]

**PUBLIC DOCUMENT—No. 45.**

43

Neponset Valley System.

<b>Land takings, purchase and recording-</b>	<b>\$1,000 00</b>	<b>\$282 00</b>	<b>\$425 00</b>	<b>\$95 00</b>	<b>\$356 49</b>	<b>\$2,168 49</b>
<b>Experts and appraisers,</b>	-	-	1,112 20	200 00	206 80	-
<b>Legal services,</b>	-	-	66 00	13 00	-	10 00
<b>Engineers' supplies,</b>	-	-	10 00	-	-	406 97
<b>Election 20,</b>	-	-	-	-	-	-
<b>Election 21,</b>	-	-	-	-	-	-
<b>Election 22,</b>	-	-	-	-	-	-
<b>Election 26,</b>	-	-	-	-	-	-
<b>Election 27,</b>	-	-	-	-	-	-
<b>Election 16,</b>	-	-	-	-	-	-
<b>Election 24,</b>	-	-	-	-	-	-
<b>Engineers, inspectors, rod-</b>	-	-	-	-	-	-
<b>men, laborers and others.</b>	-	-	-	-	-	-
<b>Travelling expenses,</b>	-	-	-	-	-	-
<b>Totals,</b>	-	-	<b>\$1,480 20</b>	<b>\$638 00</b>	<b>\$618 77</b>	<b>\$115 44</b>
						<b>\$18,842 41</b>

## *High-level Sewer — Investigation.*

## METROPOLITAN SEWERAGE.

[Jan.]

TABLE F.—EXPENSES OF BOARD OF METROPOLITAN SEWERAGE COMMISSIONERS FOR THE YEAR ENDING SEPT. 30, 1899—Concluded.  
*High-level Sewer—Investigation—Concluded.*

	1898.			1899.								Totals.	
	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	
Carriage hire, . . . .	\$9 25	\$1 00	\$15 00	\$28 00	\$11 50	-	-	-	-	-	-	-	\$64 75
Use of boat, . . . .	4 35	-	3 50	-	10 00	-	-	-	-	-	-	-	17 85
Tools and repair of same, . . .	8 40	1 20	6 80	12 15	2 30	-	-	-	-	-	-	-	30 85
Postage, telephone and telegrams, . . . .	65	90	60	-	97 75	-	-	-	-	-	-	-	99 91
Teaming and express, . . . .	28 28	1 40	16 30	7 35	14 00	-	-	-	-	-	-	-	67 38
Maps, plans and blue-prints, . . . .	-	-	-	18 57	64 88	-	-	-	-	-	-	-	83 45
Experts and appraisers, . . . .	-	-	-	140 00	-	-	-	-	-	-	-	-	140 00
Commissioners, . . . .	-	-	-	750 00	-	-	-	-	-	-	-	-	750 00
Clerical services, . . . .	-	-	-	-	12 50	-	-	-	-	-	-	-	12 50
Engineers' instruments and repair of same, . . . .	-	-	-	-	70	-	-	-	-	-	-	-	70
Printing report and maps, . . . .	-	-	-	-	1,978 59	-	-	-	-	-	-	-	1,978 59
Totals, . . . .	\$2,776 05	\$2,399 91	\$2,023 68	\$4,389 68	\$4,278 37	-	-	-	-	-	-	-	\$13,867 44

*High-level Sewer.*

Office supplies, . . . .	-	-	-	-	-	-	-	\$1 50	\$735 11	\$1,196 36
Carriage hire, . . . .	-	-	-	-	-	-	-	28 00	-	48 00
Field supplies, . . . .	-	-	-	-	-	-	-	432 37	-	1,244 80

Maps, plans and blue-prints, Engineers' instruments and repair of same, . . . . .	66 08	68 24	124 27
Commissioners, . . . . .	385 70	765 12	1,150 82
Clerk and chief engineer, . . . . .	6 60	22 00	27 60
Tools and repair of same, . . . . .	-	29 60	-
Office rent, Hyde Park, . . . . .	750 00	750 00	2,250 00
Travelling expenses, . . . . .	-	624 98	1,875 00
Clerical services, . . . . .	66 00	65 00	196 00
Repairs, fittings and supplies, building No. 1 Mt. Vernon Street. Postage, telephone and tele- grams. Engineers, inspectors, rod- men, laborers and others. Land takings, purchase and recording. Office rent, Quinney,	8 00	11 90	119 73
Section 85, . . . . .	4,988 50	3,985 27	982 30
Section 86, . . . . .	-	-	9,907 07
Section 88, . . . . .	-	-	17 60
Section 89, . . . . .	-	-	17 60
Boat and boat hire, . . . . .	-	-	17 60
Totals, . . . . .	\$7,988 12	\$5,440 00	\$18,380 50
			\$6,492 38

TABLE G.—NORTH METROPOLITAN SYSTEM.  
*Construction Account. — Bills outstanding Sept. 30, 1899.*

NAME.	Articles.	Amount.
Pittsburgh Testing Laboratory, . . .	Expert services, . . . . .	\$75 00
Waldo Bros., . . . . .	Cement, . . . . .	57 00
F. C. Ayer, . . . . .	Lumber, . . . . .	2 66
City of Boston (Institutions Department), .	Use of team, . . . . .	12 00
Walworth Manufacturing Company, .	Fittings, . . . . .	.80
Wadsworth, Howland & Co., . . .	Alcohol, . . . . .	.65
F. W. Barry, Beale & Co., . . .	Stationery, . . . . .	1 45
Boston Bolt Company, . . . .	Bolts, . . . . .	2 35
Perrin, Seamans & Co., . . . .	Flange and couplings, . . .	2 05
Chas. E. Moss, . . . . .	Blue printing, . . . .	2 85
Burditt & Williams, . . . . .	Hardware, . . . . .	.45
Ames Plow Company, . . . . .	Spades, . . . . .	1 81
Total, . . . . .		\$150 07

*Maintenance Account. — Bills outstanding Sept. 30, 1899.*

L. W. Ferdinand & Co., . . . . .	Oil coats, . . . . .	\$3 50
Ames Plow Company, . . . . .	Tools, . . . . .	2 07
Braman, Dow & Co., . . . . .	Glasses and gaskets, . . .	2 88
John P. Lovell Arms Company, . . .	Supplies, . . . . .	.55
Thorp & Martin Company, . . . .	Carbon, . . . . .	1 50
Barbour-Stockwell Company, . . . .	Grate, . . . . .	3 50
L. E. Knott Apparatus Company, . . .	Testing apparatus, . . . .	2 20
U. Holzer, . . . . .	Mounting plan, . . . .	.50
Perrin, Seamans & Co., . . . . .	Pails, . . . . .	1 50
Smith & Anthony Company, . . . .	Damper, . . . . .	.15
Theodore Metcalf Company, . . . .	Cuprous chloride, . . . .	1 15
Locke Regulator Company, . . . .	Valve and packing, . . .	8 45
T. H. Buck & Co., . . . . .	Lumber, . . . . .	38 37
Walworth Manufacturing Company, . . .	Pipe and fittings, . . . .	16 06
Nash, Winslow & Co., . . . . .	Turpentine, . . . . .	1 62
Seth W. Fuller, . . . . .	Dynamo brushes, . . . .	3 48
G. W. & F. Smith Iron Company, . . .	Iron work, . . . . .	19 58
McKenney & Waterbury, . . . . .	Lamp, . . . . .	3 50
Albert Winslow & Co., . . . . .	Rope, . . . . .	1 97
Chadwick Lead Works, . . . . .	Lead gaskets, . . . . .	2 99
F. A. Emery, . . . . .	Incidentals, . . . . .	7 73

TABLE G — *North Metropolitan System (Maintenance Account)* —  
Continued.

NAME.	Articles.	Amount.
Bertha F. Barnes, . . . . .	Clerical services, . . . . .	\$45 00
B. O. & G. C. Wilson, . . . . .	Supplies, . . . . .	3 00
Daniel McGarrigle, . . . . .	Carriage service, . . . . .	40 00
Town of Winchester, . . . . .	Use of steam roller, . . . . .	3 50
John P. Lovell Arms Company, . . .	Supplies, . . . . .	1 10
Deane Steam Pump Company, . . .	Valves and springs, . . . . .	3 75
Boston Woven Hose and Rubber Company.	Couplings, . . . . .	2 50
F. C. Ayer, . . . . .	Lumber, . . . . .	4 08
Dodge, Haley & Co., . . . . .	Iron work, . . . . .	3 48
S. A. Dinsmore & Co., . . . . .	Germol, . . . . .	1 50
Alexander Haggerston, . . . . .	Carriage service, . . . . .	2 00
Chapman Valve Manufacturing Company.	Valves, . . . . .	2 16
Horgan, Robey & Co., . . . . .	Photographic supplies, . . . . .	1 78
Boston Bolt Company, . . . . .	Bolts, . . . . .	1 17
The Fairbanks Company, . . . . .	Spindles for gates, . . . . .	1 50
Allen Bros., . . . . .	Rubber stamp, . . . . .	.90
Pittsburgh Plate Glass Company, . .	Glass, . . . . .	1 20
Dennison Manufacturing Company, . .	Supplies, . . . . .	.90
Madison C. Lewis, . . . . .	Incidentals, . . . . .	1 42
A. J. Wilkinson & Co., . . . . .	Hardware, . . . . .	8 44
Atlantic Works, . . . . .	Labor repairing sewer screens, .	28 40
Boston Bolt Company, . . . . .	Bolts, . . . . .	4 80
Boston & Maine Railroad Company, . .	Tickets, . . . . .	20 00
Geo. W. Branch, . . . . .	Pipes and fittings, . . . . .	7 89
Burditt & Williams, . . . . .	Hardware, . . . . .	21 94
J. H. Carleton, . . . . .	Stove, . . . . .	8 62
A. W. Chesterton & Co., . . . . .	Supplies, . . . . .	20 90
Crosby Steam Gage and Valve Company.	Valves, washers, etc., . . . . .	18 31
The Fairbanks Company, . . . . .	Globe discs, . . . . .	2 06
Farley, Harvey & Co., . . . . .	Bunting, . . . . .	7 32
F. E Fitts Manufacturing and Supply Company.	Waste, . . . . .	22 70
Fitz, Dana & Co., . . . . .	Iron and steel, . . . . .	11 88
Flint Bros., . . . . .	Carriage service, . . . . .	18 00
Frost & Adams Company, . . . . .	Picture frames, . . . . .	8 75
Wm. H. Gallison Company, . . . . .	Supplies, . . . . .	22 63
H. H. Harvey, . . . . .	Steel, . . . . .	7 65
Heliotype Printing Company, . . . . .	Photographic enlargement, . . .	10 75

TABLE G.—*North Metropolitan System (Maintenance Account) — Concluded.*

NAME.	ARTICLES.	AMOUNT.
India Alkali Works, . . . . .	Savogran, . . . . .	\$4 73
Knowlton Packing Company, . . . . .	Packing, . . . . .	5 18
Bradford Lewis & Son, . . . . .	Waste, . . . . .	5 42
J. H. Long Machine Company, . . . . .	Castings, . . . . .	89 00
J. H. McCafferty, . . . . .	Castings, . . . . .	13 20
Geo. McQuesten & Co., . . . . .	Lumber, . . . . .	58 88
Mechanics Iron Foundry Company, . . . . .	Castings, . . . . .	9 45
Chas. E. Moss, . . . . .	Blue printing, . . . . .	5 99
W. A. Murtfeldt, . . . . .	Coal tar, . . . . .	5 00
Paine Furniture Company, . . . . .	Chairs, . . . . .	4 50
Parry Bros. & Co., . . . . .	Brick, . . . . .	64 50
Pittsburgh Plate Glass Company, . . . . .	Glass, . . . . .	28 73
Reynolds Oil Company, . . . . .	Oil, . . . . .	38 77
City of Somerville, . . . . .	Water supply, . . . . .	58 92
Standard Oil Company, . . . . .	Oil, . . . . .	18 79
Wadsworth, Howland & Co., . . . . .	Paints, etc., . . . . .	55 88
Waldo Bros., . . . . .	Cement, . . . . .	110 00
A. J. Wilkinson & Co., . . . . .	Hardware, . . . . .	4 09
Albert Winslow & Co., . . . . .	Rope, . . . . .	27 17
G. H. Worcester & Co., . . . . .	Brooms and brushes, . . . . .	7 68
Wright & Potter Printing Company, . . . . .	Printing, . . . . .	28 36
Frank L. Young & Kimball, . . . . .	Vaseline, . . . . .	4 45
Theodore Horton, . . . . .	Incidentals, . . . . .	1 79
Smith & Anthony Company, . . . . .	Thimbles, . . . . .	20
Ames Plow Company, . . . . .	Pails, brooms and whetstones, . . . . .	2 82
Knowles Steam Pump Works, . . . . .	Tools, . . . . .	1 79
Webster, Cook & Co., . . . . .	Oil cloth, . . . . .	2 10
Globe Gas Light Company, . . . . .	Lantern wicks, . . . . .	42
Noyes Manufacturing Company, . . . . .	Disinfectant, . . . . .	50
Kate M. Hill, . . . . .	Photographs, . . . . .	1 02
Blodgett Bros. & Co., . . . . .	Labor on electric lights, . . . . .	1 12
Codman & Shurtleff, . . . . .	Sharpening instruments, . . . . .	70
F. I. Capen, . . . . .	Incidentals, . . . . .	21 52
Total, . . . . .		\$1,155 20

TABLE H.—CHARLES RIVER SYSTEM.

*Maintenance Account.—Bills outstanding Sept. 30, 1899.*

NAME.	Articles.	Amount.
M. R. Warren Company, . . . . .	Stationery, . . . . .	\$3 75
Henry J. Wright, . . . . .	Incidentals, . . . . .	7 00
F. J. Dibble, . . . . .	Recording sheets and ink, . . . . .	10 71
Ames Plow Company, . . . . .	Tools, . . . . .	2 94
C. E. Dearborn, . . . . .	Lumber, . . . . .	1 60
W. W. White & Co., . . . . .	Mounting maps, . . . . .	12 00
U. Holzer, . . . . .	Mounting plans, . . . . .	4 15
Nash, Winslow & Co., . . . . .	Asphaltum, . . . . .	8 00
T. H. Buck & Co., . . . . .	Lumber, . . . . .	6 48
J. B. Hunter & Co., . . . . .	Crutch tips, . . . . .	2 25
L. W. Ferdinand & Co., . . . . .	Capstan bars, . . . . .	5 00
Wadsworth, Howland & Co., . . . . .	Brushes, . . . . .	1 07
Henry J. Wright, . . . . .	Incidentals, . . . . .	35 88
M. R. Warren Company, . . . . .	Stationery, . . . . .	4 25
J. C. Storey & Co., . . . . .	Tarred paper, . . . . .	1 80
Total, . . . . .		\$106 88

TABLE I.—NEPONSET VALLEY SYSTEM.

*Construction Account.—Bills outstanding Sept. 30, 1899.*

NAME.	Articles.	Amount.
M. R. Warren Company, . . . . .	Stationery, . . . . .	\$3 75
Norfolk Registry of Deeds, . . . . .	Recording deed, . . . . .	68
Suffolk Registry of Deeds, . . . . .	Recording deeds, . . . . .	3 65
Thomas F. Reddy, . . . . .	Legal services, . . . . .	33 00
John Q. A. Field, . . . . .	Expert services, . . . . .	275 00
Thomas F. Cunningham, . . . . .	Land damages, . . . . .	50 00
Total, . . . . .		\$366 08

*Maintenance Account.—Bills outstanding Sept. 30, 1899.*

S. B. Balkam & Co., . . . . .	Cement, pipe and brick, . . . . .	\$45 42
City of Boston (Street Department), . . .	Stock and labor, . . . . .	75 47
Curtis & Pope Lumber Company, . . .	Brick, . . . . .	12 00

TABLE I.—*Neponset Valley System (Maintenance Account) — Concluded.*

NAME.	Articles.	Amount.
New York, New Haven & Hartford Railroad Company.	Tickets, . . . . .	\$10 00
F. D. Smith, . . . . .	Incidentals, . . . . .	18 05
Walworth Manufacturing Company, . . . . .	Die, . . . . .	60
George W. Toomey, . . . . .	Carriage service, . . . . .	7 50
John Hodgkinson & Son, . . . . .	Shavings, . . . . .	6 00
Charles A. Green, . . . . .	Hardware, . . . . .	10 98
L. W. Ferdinand & Co., . . . . .	Rope and oil clothes, . . . . .	5 67
Stoughton Rubber Company, . . . . .	Boots, . . . . .	3 56
F. D. Smith, . . . . .	Incidentals, . . . . .	25 80
Charles A. Green, . . . . .	Hardware, . . . . .	19 44
S. B. Balkam & Co., . . . . .	Lumber and cement, . . . . .	90 84
W. W. White & Co., . . . . .	Mounting plans, . . . . .	1 50
Corson Express Company, . . . . .	Teaming, . . . . .	1 25
U. Holzer, . . . . .	Mounting maps, . . . . .	1 15
Dodge, Haley & Co., . . . . .	Iron, . . . . .	2 79
Joseph Breck & Sons, . . . . .	Lawn seed, . . . . .	1 00
M. R. Warren Company, . . . . .	Stationery, . . . . .	3 75
Chas. E. Moss, . . . . .	Blue printing, . . . . .	69
F. D. Smith, . . . . .	Incidentals, . . . . .	34 51
George W. Morse, . . . . .	Lettering signs, . . . . .	2 00
T. F. Cunningham, . . . . .	Stone and gravel, . . . . .	6 00
Total, . . . . .		\$385 97

TABLE J.—HIGH-LEVEL SEWER.

NAME.	Articles.	Amount.
Wm. Hall & Co., . . . . .	Keys, . . . . .	\$2 00
W. W. Hamilton, . . . . .	Paper, . . . . .	2 00
Allen Bros, . . . . .	Rubber stamps, . . . . .	2 25
C. G. Waitt, . . . . .	Incidentals, . . . . .	20 25
E. Elbert Young, . . . . .	Incidentals, . . . . .	10 00
Houghton & Dutton, . . . . .	Cloth, soap and brush, . . . . .	1 40
F. D. Smith, . . . . .	Incidentals, . . . . .	28 22
C. B. Pratt, . . . . .	Incidentals, . . . . .	31 29
Williams, Brown & Earle, . . . . .	Rubber, . . . . .	1 75
B. H. Davis, . . . . .	Services as assistant engineer, . .	46 15

TABLE J.—*High-level Sewer*—Continued.

NAME.	ARTICLES.	AMOUNT.
M. F. Sanborn,	Incidentals,	\$3 12
D. C. Warren,	Incidentals,	8 29
F. W. Barry, Beale & Co.,	Note books,	75
H. E. Morine & Co.,	Altering sign,	75
A. D. MacLachlan,	Cross section paper,	68
Appleton & Bassett,	Electric house lamp,	8 00
Damon Safe and Iron Works Company,	Opening safe and labor on combination lock.	8 00
Stoughton Rubber Company,	Rubber boots,	8 84
Dennison Manufacturing Company,	Supplies,	1 08
L. W. Ferdinand & Co.,	Oars,	1 82
Heitiotype Printing Company,	Negative and print,	2 00
Jas. J. Shannon & Co.,	File and lettering size,	2 50
F. W. Barry, Beale & Co.,	Office supplies,	45
F. A. Walker & Co.,	Coal hose,	1 90
Walworth Manufacturing Company,	Gas piping,	7 76
Allen Bros.,	Rubber stamps,	7 00
S. B. Balkam & Co.,	Lumber, etc.,	97 44
Burditt & Williams,	Hardware,	6 81
J. H. Carleton,	Stove,	12 00
Con Cleary,	Moving tools,	9 20
Damrell & Upham,	Books,	4 00
Derby Desk Company,	Furniture,	17 50
Edison Electric Illuminating Company,	Electric service,	14 28
Engineering Record,	Advertising,	18 40
J. L. Fairbanks Company,	Mozeltic pens,	15 00
Frost & Adams Company,	Supplies,	32 94
Thomas Groom & Co.,	Letter book,	4 00
Hammond Typewriter Company,	Repairing typewriter,	1 42
H. H. Harvey,	Boring outfit,	6 68
U. Holzer,	Mounting prints,	6 06
Horgan, Robey & Co.,	Photographic supplies,	17 07
B. Johnson,	Lumber,	29 68
Journal Newspaper Company,	Advertising,	32 25
James H. Landers,	Hardware,	9 06
McKenney & Waterbury,	Gas fixtures,	7 70
George W. Morse,	Lettering and making signs,	6 80
Charles E. Moss,	Blue printing,	33 45
E. C. Smith,	Ink-bottle boxes,	4 25

TABLE J.—*High-level Sewer*—Continued.

NAME.	Articles.	Amount.
Thorp & Martin Company, . . .	Office supplies, . . . . .	\$18 33
Wadsworth, Howland & Co., . . .	Paints, etc., . . . . .	31 71
M. R. Warren Company, . . . .	Stationery, . . . . .	6 95
Wellington-Wild Coal Company, . .	Coal and wood, . . . . .	51 25
A. J. Wilkinson & Co., . . . .	Plumb bobs, . . . . .	2 25
Williams & Daly, . . . . .	Repairing roof, . . . . .	23 43
Wright & Potter Printing Company, .	Printing, . . . . .	201 26
Wyckoff, Seamans & Benedict, . .	Typewriter supplies, . . .	10 10
Elms, Arey & Co., . . . . .	Window, . . . . .	3 75
John Hodgkinson & Son, . . . .	Sawing and planing, . . .	4 70
Walworth Manufacturing Company, .	Pipe and fittings, . . . .	15 15
G. L. Richardson, . . . . .	Plans, . . . . .	10 00
Massachusetts Towel Supply Company, .	Towel supply, . . . . .	3 25
F. D. Smith, . . . . .	Incidentals, . . . . .	28 15
Geo. H. Richter, . . . . .	Polishing desk, . . . . .	2 25
F. T. Daniels, . . . . .	Services as draughtsman, .	18 52
Waldo Bros., . . . . .	Lime, . . . . .	1 10
Boston Blower Company, . . . .	Drilling couplings, . . .	3 00
Walworth Manufacturing Company, .	Fittings, . . . . .	32
Hopkinson & Holden, . . . . .	Cocoa fibre mats, . . . .	2 00
L. H. Bigelow, . . . . .	Services as rodman, . . .	25 19
L. W. Furlong, . . . . .	Services as rodman, . . .	31 48
Pittsburgh Plate Glass Company, .	Glass, . . . . .	1 24
Albert Winslow & Co., . . . .	Rope, . . . . .	1 44
F. A. Walker & Co., . . . . .	Cooler drainer, . . . .	3 00
T. C. Tuck, . . . . .	Services as rodman, . . .	19 26
Henry Cleary, . . . . .	Incidentals, . . . . .	4 90
A. G. Nelson, . . . . .	Services as janitor, . . .	2 50
J. H. Stubbs, . . . . .	Incidentals, . . . . .	16 00
L. W. Ferdinand & Co., . . . .	Sounding leads, . . . .	1 80
M. Myers, . . . . .	Engineering supplies, . .	2 15
Houghton & Dutton, . . . . .	Tape, . . . . .	90
John W. Nash, . . . . .	Stone water jar, . . . .	1 75
Henry Cleary, . . . . .	Incidentals, . . . . .	9 35
A. E. Swan, . . . . .	Services as rodman, . . .	13 85
Wyckoff, Seamans & Benedict, . .	Typewriter supplies, . . .	3 80
Frank A. Emery, . . . . .	Incidentals, . . . . .	2 90
O. B. Pratt, . . . . .	Incidentals, . . . . .	94 05

TABLE J.—*High-level Sewer*—Concluded.

NAME.	Articles.	Amount.
F. D. Smith, . . . . .	Incidentals, . . . . .	\$2 46
R. H. Sumner, . . . . .	Incidentals, . . . . .	7 00
A. H. Smith, . . . . .	Use of transit and tripod, . . .	5 94
Total, . . . . .	. . . . .	\$1,267 74

TABLE K.—CASES PENDING IN COURT.

*North Metropolitan System.*

Boston *v.* Commonwealth (land damage, Deer Island), petition.  
 Booth *v.* Commonwealth (Section 50, Melrose and Wakefield), breach of contract.  
 Connolly *v.* Commonwealth (action of tort for personal injuries to employee of contractor, Deer Island), tort.  
 Penney *v.* Commonwealth (land damage, North Cambridge), petition.  
 Sheehan *v.* Commonwealth (Medford), breach of contract.  
 Stone *et al.* *v.* Commonwealth (land damage, Everett and Charlestown), petition.  
 Stone *et al.* *v.* Commonwealth (land damage, Everett and Charlestown), petition.  
 Stone *et al.* *v.* Commonwealth (land damage, Everett and Charlestown), petition.  
 Stone *et al.* *v.* Commonwealth (land damage, Everett and Charlestown), petition.

*Neponset Valley System.*

Boston *v.* Kingman *et al.* (West Roxbury), tort.  
 Boston *v.* Commonwealth (West Roxbury), petition.  
 Cochrane *v.* Commonwealth (land damage, Dedham), petition.  
 Evangelical Church *v.* Sewerage Commission (land damage, West Roxbury), petition.  
 Holyhood Cemetery *v.* Commonwealth (land damage, West Roxbury), petition.  
 Krug *v.* Commonwealth (land damage, West Roxbury), petition.  
 Nawn *v.* Commonwealth (sections 13-16), breach of contract.  
 Noon *v.* Commonwealth (land damage, West Roxbury), petition.  
 Rohan *v.* Commonwealth (injury by blasting during construction of sewer, Dedham), tort.  
 Richards *et al.* *v.* Commonwealth (land damage, West Roxbury), petition.

TABLE L.—LIST OF CONNECTIONS TO DATE (SEPT. 30, 1899).

*North Metropolitan System.*

DATE AUTHORIZED.	CITY OR TOWN.	LOCATION OF CONNECTION.	SIZE.	DATE OF COMPLETION.
Aug. 24, 1895,	Arlington,	Henderson Street, at Alewife Brook, . . . . .	10 inch,	Sept. 20, 1895.
May 9, 1896,	Arlington,	At the end of the metropolitan sewer in Decatur Street, . . . . .	18 inch,	June 20, 1896.
May 1, 1897,	Arlington,	Broadway, at Alewife Brook, near town line, . . . . .	15 inch,	June 19, 1897.
Sept. 3, 1898,	Arlington,	Lowell and Bow streets, . . . . .	8 inch,	Aug. 30, 1898.
Sept. 24, 1898,	Arlington,	Park and Massachusetts avenues, . . . . .	5 inch,	Sept. 27, 1898.
Sept. 24, 1898,	Arlington,	Massachusetts and Park avenues, . . . . .	5 inch,	Sept. 21, 1898.
Sept. 24, 1898,	Arlington,	Park and Massachusetts avenues, . . . . .	5 inch,	Sept. 24, 1898.
Oct. 15, 1898,	Arlington,	Man-hole at junction of Massachusetts and Park avenues, . . . . .	10 inch,	Sept. 21, 1898.
Oct. 15, 1898,	Arlington,	Park Avenue, near Boston & Maine Railroad, . . . . .	12 inch,	-
Oct. 22, 1898,	Arlington,	Massachusetts Avenue, near station 33+78.3, . . . . .	5 inch,	Oct. 21, 1898.
Nov. 5, 1898,	Arlington,	Massachusetts Avenue, near man-hole at junction of Massachusetts Avenue and Mystic Street, . . . . .	5 inch,	Nov. 12, 1898.
Nov. 5, 1898,	Arlington,	Park Avenue, 100 feet south of Boston & Maine Railroad, . . . . .	12 inch,	Nov. 9, 1898.
Dec. 3, 1898,	Arlington,	Medford Street, at junction of Chestnut Street, . . . . .	5 inch,	Dec. 10, 1898.
Dec. 3, 1898,	Arlington,	Chestnut Street, 200 feet west of man-hole at its junction with Medford Street, . . . . .	5 inch,	Dec. 12, 1898.
Dec. 10, 1898,	Arlington,	Chestnut Street, 297.5 feet west of man-hole at junction of Chestnut and Medford streets, . . . . .	5 inch,	Dec. 15, 1898.
Dec. 24, 1898,	Arlington,	Twenty public connections in operation Sept. 17, 1898, along that portion of the local sewers of the town of Arlington purchased by the Metropolitan Sewerage Commission, as authorized by chapter 520, Acts of 1897, . . . . .	-	-
Dec. 24, 1898,	Arlington,	Twenty-five special house connections in operation Sept. 17, 1898, along that portion of the local sewers of the town of Arlington purchased by the Metropolitan Sewerage Commission, as authorized by chapter 520, Acts of 1897, . . . . .	5 inch,	-
April 15, 1899,	Arlington,	Lewis Avenue, 842.1 feet east of man-hole at Medford Street, . . . . .	5 inch,	Apr. 10, 1899.
April 22, 1899,	Arlington,	Lewis Avenue, 429.1 feet east of man-hole at junction of Medford Street, . . . . .	5 inch,	Apr. 20, 1899.
April 22, 1899,	Arlington,	Lewis Avenue, 375.3 feet east of man-hole at junction of Medford Street, . . . . .	5 inch,	Apr. 17, 1899.

TABLE L.—*List of Connections, etc. (North Metropolitan System) — Continued.*

DATE AUTHORIZED.	CITY OR TOWN.	LOCATION OF CONNECTION.	SIZE.	DATE OF COMPLETION.
April 29, 1899,	Arlington, .	Massachusetts Avenue, 7.7 feet east of man-hole near Hobb's Court, . . . . .	5 inch,	May 9, 1899.
April 29, 1899,	Arlington, .	Massachusetts Avenue, near junction of Appleton Street, . . .	5 inch,	To be made.
May 13, 1899,	Arlington, .	Massachusetts Avenue, near its junction with Vine Street, . . .	8 inch,	May 22, 1899.
June 16, 1899,	Arlington, .	Massachusetts Avenue, near its junction with Mt. Vernon Street, . . . . .	5 inch,	June 15, 1899.
July 8, 1899,	Arlington, .	At man-hole at Alewife Brook, near Arlington Branch, Boston & Maine Railroad, . . . . .	18 inch,	Aug. 29, 1899.
Sept. 2, 1899,	Arlington, .	Massachusetts Avenue, 101.7 feet east of man-hole at the Lexington town line, . . . . .	5 inch,	Sept. 26, 1899.
Sept. 2, 1899,	Arlington, .	Massachusetts Avenue, 198.2 feet west of man-hole at its junction with Mill Street, . . . . .	5 inch,	Sept. 5, 1899.
Sept. 9, 1899,	Arlington, .	Massachusetts Avenue, 76 feet west of man-hole at its junction of Crusher Lane, . . . . .	5 inch,	Sept. 12, 1899.
Mar. 2, 1896,	Belmont, .	Near Hills Crossing, . . . . .	15 inch,	June 18, 1896.
Aug. 1, 1896,	Boston,*	About 200 feet south of shaft at the southerly end of siphon at man-hole in Alford Street, in the park, . . . . .	15 inch,	Sept. 28, 1896.
Oct. 10, 1896,	Boston,*	Navy Yard, on the northerly side of the metropolitan sewer in said yard, . . . . .	15 inch,	Nov. 1, 1896.
Dec. 5, 1896,	Boston,*	On Chelsea Street, opposite Vine Street, . . . . .	15 inch,	Mar. 2, 1897.
Mar. 27, 1897,	Boston,*	Water Street, near Wapping Street, . . . . .	15 inch,	Nov. 18, 1898.
Mar. 27, 1897,	Boston,*	Chelsea Street, near Medford Street, . . . . .	24 inch,	Mar. 30, 1897.
June 10, 1897,	Boston,*	Rutherford Avenue, near Dunstable Street,† . . . . .	24 inch,	June 25, 1897.
Sept. 14, 1895,	Boston,‡	Orleans and Decatur streets,† . . . . .	16 inch,	Oct. 11, 1895.
Nov. 30, 1895,	Boston,‡	Butler Avenue, Orient Heights, . . . . .	12 inch,	Jan. 28, 1896.
May 23, 1896,	Boston,‡	Condor Street, near Meridian Street, . . . . .	15 inch,	Aug. 14, 1896.
Dec. 12, 1896,	Boston,‡	Border Street, near Decatur Street,† . . . . .	12 inch,	Feb. 26, 1897.
Nov. 28, 1896,	Boston,‡	At the junction of Bremen and Porter streets,† . . . . .	18 inch,	Nov. 30, 1896.
Dec. 5, 1896,	Boston,‡	Condor Street, near Meridian Street, . . . . .	12 inch,	Jan. 26, 1897.
Jan. 10, 1897,	Boston,‡	Border Street, near Kutaw Street,† . . . . .	12 inch,	Apr. 2, 1897.

\* Charlestown district.

† Connected, but not in operation at this date.

‡ East Boston district.

TABLE L.—*List of Connections, etc. (North Metropolitan System) — Continued.*

DATE AUTHORIZED.	CITY OR TOWN.	LOCATION OF CONNECTION.	SIZE.	DATE OF COMPLETION.
Jan. 19, 1897,	Boston,*	Border Street, near Lexington Street,† . . . . .	10 feet,	Apr. 27, 1897.
Feb. 13, 1897,	Boston,*	Butler Avenue, corner Saratoga Street (temporary), . . . . .	-	-
June 12, 1897,	Boston,*	New Street, at Sumner Street, . . . . .	12 inch,	June 14, 1897.
June 12, 1897,	Boston,*	House, Bennington Street, near Saratoga Street, . . . . .	-	-
July 31, 1897,	Boston,*	Maverick Street, near Jeffries Street,† . . . . .	12 inch,	July 30, 1897.
July 31, 1897,	Boston,*	Maverick Street, near Cottage Street,† . . . . .	12 inch,	Sept. 9, 1897.
Aug. 1, 1896,	Boston,‡	About Station 19+20, . . . . .	8 inch,	Aug. 21, 1896.
Aug. 1, 1896,	Boston,‡	Station 12+30, . . . . .	8 inch,	To be made.
Sept. 18, 1897,	Boston,‡	Station 22+30, . . . . .	8 inch,	Oct. 12, 1897.
Oct. 2, 1897,	Boston, .	Maverick and Lamson streets, . . . . .	12 inch,	Oct. 8, 1897.
Dec. 4, 1897,	Boston, .	Jeffries and Sumner streets, . . . . .	12 inch,	Dec. 23, 1897.
Jan. 15, 1898,	Boston, .	Marginal and Ruth streets, . . . . .	12 inch,	Jan. 19, 1898.
Mar. 12, 1898,	Boston, .	Roland and Crescent streets, . . . . .	12 inch,	Mar. 28, 1898.
Mar. 26, 1898,	Boston, .	Marginal and Cottage streets, . . . . .	12 inch,	Apr. 26, 1898.
April 23, 1898,	Boston, .	Eagle Square, . . . . .	18 inch,	June 18, 1898.
April 23, 1898,	Boston, .	Front Street, near Mason Street, . . . . .	12 inch,	May 5, 1898.
June 18, 1898,	Boston, .	Front Street, near Union Street, . . . . .	12 inch,	July 17, 1898.
July 30, 1898,	Boston, .	Water Street, near Gray Street, . . . . .	16 inch,	Aug. 2, 1898.
Oct. 15, 1898,	Boston,§	Water Street, near Charles River Avenue, . . . . .	12 inch,	Oct. 15, 1898.
Dec. 3, 1898,	Boston,§	Main Street, near Beach Street, . . . . .	18 inch,	Dec. 16, 1897.
Mar. 11, 1899,	Boston,§	Chelsea Street, near Navy Yard, . . . . .	6 inch,	Apr. 4, 1899.
June 24, 1899,	Boston,*	Chelsea Street, near Addison Street, . . . . .	12 inch,	July 28, 1899.
July 29, 1899,	Boston,§	In United States Navy Yard, . . . . .	12 inch,	June 23, 1899.
Oct. 4, 1895,	Cambridge, .	Corner Portland and Binney streets, . . . . .	48 inch,	Dec. 4, 1894.
May 4, 1895,	Cambridge, .	Massachusetts Avenue and Alewife Brook, . . . . .	15 inch,	June 14, 1895.
May 4, 1895,	Cambridge, .	Belmont Rindge Avenue, formerly Spruce Street, . . . . .	15 inch,	June 26, 1895.
May 4, 1895,	Cambridge, .	Concord Avenue, . . . . .	15 inch,	Aug. 21, 1895.
July 6, 1895,	Cambridge, .	Mt. Auburn and Lowell streets, . . . . .	27×28 in.	Aug. 24, 1895.
Aug. 10, 1895,	Cambridge, .	Mt. Auburn Street, corner Willard Street, . . . . .	12 inch,	Oct. 11, 1895.
Oct. 4, 1895,	Cambridge, .	Near Concord Avenue, for Niles Bros.' slaughtering establishment, . . . . .	8 inch,	Nov. 30, 1895.

\* East Boston district.

† Connected, but not in operation at this date.

‡ Deer Island.

§ Charlestown district.

TABLE L.—*List of Connections, etc. (North Metropolitan System) — Continued.*

DATE AUTHORIZED.	CITY OR TOWN.	LOCATION OF CONNECTION.	SIZE.	DATE OF COMPLETION.
Oct. 4, 1895,	Cambridge, .	Mt. Auburn Street, corner Hawthorn Street, . . . . .	18 inch,	Dec. 12, 1895.
Mar. 14, 1896,	Cambridge, .	Dunster Street, . . . . .	12 inch,	June 1, 1896.
Mar. 14, 1896,	Cambridge, .	Corner Dyke and Plympton streets, . . . . .	30 inch,	June 30, 1896.
Oct. 19, 1895,	Cambridge, .	Brookline Street, near Cottage Farm station, . . . . .	10 inch,	Aug. 1, 1896.
July 22, 1896,	Cambridge, .	In private land near Alewife Brook, near Massachusetts Avenue (Tannery Brook connection), . . . . .	15 inch,	Aug. 28, 1896.
Mar. 14, 1896,	Cambridge, .	Pearl Street, . . . . .	20 inch,	Aug. 31, 1896.
Aug. 10, 1895,	Cambridge, .	North side of Mt. Auburn Street, at Sparks Street, . . . . .	15 inch,	Oct. 3, 1895.
Mar. 14, 1896,	Cambridge, .	Waverly and Talbot streets, . . . . .	20 inch,	June 24, 1897.
Mar. 14, 1896,	Cambridge, .	Western Avenue, . . . . .	22 inch,	Nov. 30, 1896.
Mar. 14, 1896,	Cambridge, .	Elliot Square, . . . . .	15 inch,	Oct. 24, 1896.
Mar. 14, 1896,	Cambridge, .	Pleasant Street, . . . . .	20 inch,	Oct. 5, 1896.
Sept. 17, 1898,	Cambridge, .	Albany Street and Massachusetts Avenue, . . . . .	18 inch,	June 10, 1899.
July 22, 1899,	Cambridge, .	Albany Street near Pacific Street, . . . . .	28 inch,	Aug. 31, 1899.
Oct. 24, 1896,	Chelsea, .	Second Street, near Cypress Street, . . . . .	15 inch,	Aug. 24, 1897.
Mar. 13, 1897,	Chelsea, .	Second Street, near Cypress Street, . . . . .	6 inch,	May 3, 1897.
June 19, 1897,	Chelsea, .	Marginal Street, corner Hawthorn Street, . . . . .	12 inch,	Sept. 9, 1897.
June 19, 1897,	Chelsea, .	Marginal Street, near Shurtleff Street, . . . . .	10 inch,	Sept. 8, 1897.
July 3, 1897,	Chelsea, .	Second Street (temporary only for Metropolitan Water Board), . . . . .	-	Aug. 24, 1897.
Oct. 30, 1897,	Chelsea, .	Second Street, at Spruce Street, . . . . .	18 inch,	Nov. 17, 1897.
Mar. 24, 1894,	Everett, .	Under tracks of Boston & Maine Railroad, near East Everett station, . . . . .	24 inch,	July 3, 1894.
April 20, 1895,	Everett, .	West Everett, near Faxon's Foundry, . . . . .	20 inch,	July 10, 1895.
Sept. 18, 1897,	Everett, .	Second Street (temporary only for Metropolitan Water Board), . . . . .	-	Sept. 12, 1897.
Jan. 29, 1898,	Everett, .	Fleet Street Court, Station 12 +44.35 on Section 17, north metropolitan sewer, . . . . .	15 inch,	Never made.
Sept. 2, 1899,	Everett, .	At the junction of Bryant and Rich Streets, at the Malden line, . . . . .	15 inch,	Aug. 2, 1899.
Nov. 4, 1893,	Malden, .	Corner Charles and Middlesex streets, . . . . .	25×38 in.	Jan. 9, 1894.
May 5, 1894,	Malden, .	Extension of Pearl Street, near boundary line between Malden and Medford, . . . . .	24 inch,	May 20, 1894.
Aug. 25, 1894,	Malden, .	Mountain Avenue, . . . . .	15 inch,	Dec. 17, 1894.

TABLE L.—*List of Connections, etc. (North Metropolitan System) — Continued.*

DATE AUTHORIZED.	CITY OR TOWN.	LOCATION OF CONNECTION.	SIZE.	DATE OF COMPLETION.
Nov. 3, 1894,	Malden, . .	Medford Street, corner Canal Street, . . . . .	15 inch,	Mar. 30, 1895.
July 8, 1897,	Malden, . .	Jackson Street (temporary), . . . . .	12 inch,	July 24, 1897.
Sept. 10, 1898,	Malden, . .	Bryant and Boylston streets, . . . . .	8 inch,	Oct. 7, 1898.
Oct. 16, 1898,	Malden, . .	Bryant Street (house connection, . . . . .)	6 inch,	Oct. 15, 1898.
Nov. 5, 1898,	Malden, . .	Bryant Street, south of Cross Street, . . . . .	5 inch,	Nov. 5, 1898.
Dec. 3, 1898,	Malden, . .	Bryant Street, north of man-hole at Cross Street, . . . . .	6 inch,	To be made.
Dec. 24, 1898,	Malden, . .	Sixteen public connections in operation Oct. 8, 1898, along that portion of the local sewers of the city of Malden purchased by the Metropolitan Sewerage Commission, as authorized by chapter 215 of the Acts of 1898, . . . . .	-	-
Dec. 24, 1898,	Malden, . .	Seventy-two special house connections in operation Oct. 8, 1898, along that portion of the local sewers of the city of Malden purchased by the Metropolitan Sewerage Commission, as authorized by chapter 215 of the Acts of 1898, . . . . .	5 inch,	-
Apr. 29, 1899,	Malden, . .	Eastern Avenue (house connection), . . . . .	6 inch,	Apr. 29, 1899.
April 29, 1899,	Malden, . .	Bryant Street, near Cross Street, . . . . .	6 inch,	May 2, 1899.
June 10, 1899,	Malden, . .	Bryant Street, south of Cross Street, . . . . .	6 inch,	June 12, 1899.
June 24, 1899,	Malden, . .	House, Eastern Avenue, . . . . .	6 inch,	July 1, 1899.
Sept. 2, 1899,	Malden, . .	Bryant Street, near Cross Street, . . . . .	6 inch,	Aug. 10, 1899.
Sept. 2, 1899,	Malden, . .	Bryant Street, . . . . .	6 inch,	Aug. 29, 1899.
May 26, 1894,	Medford, .	Riverside Avenue, near to and east of Gravelly Creek, . . . . .	18 inch,	June 18, 1894.
May 26, 1894,	Medford, .	South side of the metropolitan sewer in Medford Square, . . . . .	12 inch,	June 13, 1894.
May 26, 1894,	Medford, .	Riverside Avenue, junction of Spring Street, . . . . .	15 inch,	Oct. 19, 1894.
May 26, 1894,	Medford, .	Riverside Avenue, junction of Park and Marine avenues, . . . . .	12 inch,	Nov. 9, 1894.
Aug. 25, 1894,	Medford, .	In private land at the west end of Canal Street and Boston Avenue, . . . . .	12 inch,	Sept. 12, 1894.
Aug. 25, 1894,	Medford, .	Corner of Prospect and Cottage streets, . . . . .	12 inch,	Sept. 14, 1894.
Aug. 25, 1894,	Medford, .	In private land, about 460 feet from the corner of Winthrop and High streets, . . . . .	12 inch,	Nov. 20, 1894.
July 6, 1895,	Medford, .	Junction Middlesex Avenue and Third Street, Wellington district, . . . . .	15 inch,	July 16, 1895.

TABLE L.—*List of Connections, etc. (North Metropolitan System) — Continued.*

DATE AUTHORIZED.	CITY OR TOWN.	LOCATION OF CONNECTION.	SIZE.	DATE OF COMPLETION.
July 6, 1895,	Medford,	Craddock Avenue, Wellington district, . . . . .	12 inch,	Sept. 18, 1895.
Sept. 7, 1895,	Medford,	Mystic Avenue, at end of Section 35, . . . . .	20 inch,	Jan. 6, 1896.
Sept. 7, 1895,	Medford,	High Street, rear of St. Joseph's Church, . . . . .	10 inch,	To be made.
July 1, 1896,	Medford,	Boston Avenue, . . . . .	8 inch,	July 23, 1896.
July 22, 1896,	Medford,	Jerome Street, West Medford, .	12 inch,	Oct. 29, 1896.
April 17, 1897,	Medford,	House of R. T. Howes, Prescott Street, near Mystic Street (temporary), . . . . .	6 inch,	May 17, 1897.
April 17, 1897,	Medford,	Houses of Fuller and Forest, at a point about 200 feet west of Bradbury Avenue (temporary), .	6 inch,	May 17, 1897.
May 15, 1897,	Medford,	At west end of Madison Street, .	16 inch,	July 17, 1897.
May 29, 1897,	Medford,	Riverside Avenue, opposite Locust Street, . . . . .	15 inch,	June 26, 1897.
Nov. 20, 1897,	Medford,	Riverside Avenue, near Spring Street, house of Eugene W. Keay, . . . . .	6 inch,	Nov. 30, 1897.
Nov. 20, 1897,	Medford,	Prescott Street, near Allston Street, house of Mrs. Estelle Z. Beakman, . . . . .	6 inch,	Nov. 29, 1897.
May 7, 1898,	Medford,	Near Hastings Lane, . . . . .	8 inch,	May 17, 1898.
Sept. 8, 1898,	Medford,	House, 350 Riverside Avenue, .	5 inch,	Aug. 23, 1898.
April 22, 1899,	Medford,	Prescott Street, at the centre of Mystic Street (temporary), .	6 inch,	Apr. 27, 1899.
July 21, 1894,	Melrose,	Corner Wyoming Avenue and Pleasant Street, . . . . .	20 inch,	Dec. 15, 1894.
Sept. 5, 1896,	Melrose,	Corner Gould and Pleasant streets, .	16 inch,	Sept. 25, 1896.
Sept. 5, 1896,	Melrose,	Corner Gilbert and Pleasant streets, . . . . .	12 inch,	Oct. 5, 1896.
May 29, 1897,	Melrose,	House 45 Myrtle Street (temporary), . . . . .	5 inch,	May 19, 1897.
Dec. 19, 1896,	Melrose,	At Station 29+05 Essex Street, .	5 inch,	Dec. 21, 1896.
May 1, 1897,	Melrose,	Myrtle Street, about 210 feet north of Foster Street, . . . . .	5 inch,	May 11, 1897.
May 29, 1897,	Melrose,	House, 23 Grove Street, west of man-hole at Myrtle Street, . . . . .	5 inch,	May 19, 1897.
May 29, 1897,	Melrose,	House, 19 Grove Street, near man-hole at Mystic Street, . . . . .	5 inch,	May 19, 1897.
Dec. 4, 1897,	Melrose,	Melrose Street extension and Warren Street, . . . . .	8 inch,	Dec. 7, 1897.
Dec. 4, 1897,	Melrose,	Melrose Street extension and Gordon Street, . . . . .	6 inch,	Dec. 10, 1897.
Dec. 4, 1897,	Melrose,	Melrose Street extension and Warren Street, . . . . .	6 inch,	Dec. 9, 1897.
Dec. 4, 1897,	Melrose,	Melrose and Belmont streets, .	6 inch,	Dec. 7, 1897.

TABLE L.—*List of Connections, etc. (North Metropolitan System) — Continued.*

DATE AUTHORIZED.	CITY OR TOWN.	LOCATION OF CONNECTION.	SIZE.	DATE OF COMPLETION.
Dec. 4, 1897,	Melrose,	Melrose and Tremont streets, .	6 inch,	Dec. 8, 1897.
Dec. 4, 1897,	Melrose,	Melrose Street extension and Men-dum Street, . . . . .	6 inch,	Dec. 8, 1897.
Dec. 4, 1897,	Melrose,	Franklin and Greenwood streets, .	8 inch,	Dec. 7, 1897.
Dec. 4, 1897,	Melrose,	Tremont and Melrose streets, .	6 inch,	Dec. 10, 1897.
Dec. 4, 1897,	Melrose,	Vinton Street and Brunswick Park, . . . . .	8 inch,	Dec. 10, 1897.
Dec. 4, 1897,	Melrose,	Melrose Street extension and Vin-ton Street, . . . . .	6 inch,	Dec. 10, 1897.
Dec. 4, 1897,	Melrose,	House 25 Myrtle Street, . . .	5 inch,	Dec. 24, 1897.
Dec. 4, 1897,	Melrose,	House 160 Franklin Street, . . .	5 inch,	Dec. 13, 1897.
Dec. 18, 1897,	Melrose,	House of S. E. Benson, on Tre-mont Street, . . . . .	5 inch,	Dec. 21, 1897.
April 23, 1898,	Melrose,	House 22 Greenwood Street, . .	5 inch,	Oct. 26, 1898.
April 23, 1898,	Melrose,	House 199 Tremont Street, . .	5 inch,	Apr. 29, 1898.
June 11, 1898,	Melrose,	House 121 Essex Street, . . .	5 inch,	June 14, 1898.
June 18, 1898,	Melrose,	House 1 Franklin Terrace, . .	5 inch,	June 14, 1898.
June 18, 1898,	Melrose,	House 2 Franklin Terrace, . .	5 inch,	June 14, 1898.
June 18, 1898,	Melrose,	House 3 Franklin Terrace, . .	5 inch,	June 14, 1898.
July 30, 1898,	Melrose,	House 199 Essex Street, . . .	5 inch,	Aug. 3, 1898.
July 30, 1898,	Melrose,	House Franklin Terrace, . . .	5 inch,	June 14, 1898.
Sept. 24, 1898,	Melrose,	Near Franklin Street, . . . .	8 inch,	Nov. 25, 1898.
Oct. 22, 1898,	Melrose,	Belmont Street, 100 feet south of Franklin Street, . . . .	5 inch,	Nov. 1, 1898.
Dec. 3, 1898,	Melrose,	Franklin Street, between Belmont and Greenwood streets, Melrose Highlands, . . . . .	5 inch,	Dec. 13, 1898.
Dec. 24, 1898,	Melrose,	Thirteen public connections in operation Nov. 21, 1898, along that portion of the local sewers of the town of Melrose purchased by the Metropolitan Sewerage Commission, as authorized by chapter 414, Acts of 1896, and chapter 88 of the Acts of 1897, .	-	-
Dec. 24, 1898,	Melrose,	Thirty special house connections in operation Nov. 21, 1898, along that portion of the local sewers of the town of Melrose purchased by the Metropolitan Sewerage Commission, as authorized by chapter 414, Acts of 1896, and chapter 88, Acts of 1897, .	5 inch,	-
May 6, 1899,	Melrose,	Tremont Street, premises 110, .	5 inch,	June 21, 1899.
May 6, 1899,	Melrose,	House 328 Franklin Street, . .	5 inch,	May 16, 1899.
May 6, 1899,	Melrose,	House 334 Franklin Street, . .	5 inch,	To be made.
May 6, 1899,	Melrose,	House 346 Franklin Street, . .	5 inch,	June 22, 1899.

TABLE L.—*List of Connections, etc. (North Metropolitan System) — Continued.*

DATE AUTHORIZED.	CITY OR TOWN.	LOCATION OF CONNECTION.	SIZE.	DATE OF COMPLETION.
May 6, 1890,	Melrose,	Tremont Street, to premises 93 Lake Avenue, . . . . .	5 inch,	May 23, 1890.
May 20, 1890,	Melrose,	Brunswick Park, west of man-hole at Brunswick Way, . . .	5 inch,	May 23, 1890.
June 16, 1890,	Melrose,	House, Greenwood Street, . . .	5 inch,	June 23, 1890.
June 16, 1890,	Melrose,	Melrose Street extension, north of man-hole in Warren Street, . .	5 inch,	To be made.
June 16, 1890,	Melrose,	Melrose Street extension, west of man-hole in Warren Street, . .	5 inch,	June 21, 1890.
June 16, 1890,	Melrose,	Franklin Street, near Belmont Street, . . . . .	5 inch,	June 22, 1890.
July 1, 1890,	Melrose,	House, Wyoming Avenue, . . .	5 inch,	June 23, 1890.
July 15, 1890,	Melrose,	Myrtle Street, near Essex Street, . . .	5 inch,	June 26, 1890.
July 15, 1890,	Melrose,	Belmont Street, near Belmont Place, . . . . .	5 inch,	July 7, 1890.
July 15, 1890,	Melrose,	Franklin Street, near Belmont Street, . . . . .	5 inch,	June 14, 1890.
July 15, 1890,	Melrose,	Melrose Street, west of man-hole in Tremont Street, . . .	5 inch,	June 23, 1890.
July 22, 1890,	Melrose,	Private land between Melrose Street extension and Franklin Terrace, . . . . .	5 inch,	Sept. 15, 1890.
July 22, 1890,	Melrose,	Melrose Street extension, west of man-hole at Warren Street, . .	5 inch,	July 18, 1890.
Sept. 2, 1890,	Melrose,	Tremont Street, Melrose Highlands, . . . . .	5 inch,	Aug. 7, 1890.
Sept. 2, 1890,	Melrose,	Melrose Street, west of man-hole at Tremont Street, . . .	5 inch,	Aug. 9, 1890.
Sept. 2, 1890,	Melrose,	Franklin Terrace, . . . . .	5 inch,	Aug. 7, 1890.
Sept. 2, 1890,	Melrose,	At the junction of Belmont Street and Belmont Place, . . .	6 inch,	Aug. 26, 1890.
Sept. 23, 1890,	Melrose,	Proposed street through meadow on estate of F. A. Messenger, .	5 inch,	Sept. 23, 1890.
Sept. 23, 1890,	Melrose,	Brunswick Park, . . . . .	5 inch,	Sept. 22, 1890.
Nov. 9, 1895,	Somerville,	On Mystic Avenue, at Moreland Street, . . . . .	12 inch,	Mar. 21, 1896.
April 25, 1896,	Somerville,	Corner Mystic and Winthrop avenues, . . . . .	30 inch,	May 29, 1896.
May 16, 1896,	Somerville,	Corner Rowland and Waverly streets, . . . . .	24 inch,	July 21, 1896.
Sept. 19, 1896,	Somerville,	Corner Somerville Avenue and Poplar Street, . . . . .	48 inch,	Oct. 20, 1896.
June 4, 1898,	Somerville,	Broadway, near Alewife Brook, .	12 inch,	Aug. 15, 1898.
July 9, 1898,	Somerville,	Woodstock Street, near Waterhouse Street, . . . . .	12 inch,	Sept. 21, 1898.
Sept. 24, 1898,	Somerville,	Somerville Avenue and Poplar Street, . . . . .	2 foot,	Nov. 1, 1898.

TABLE L.—*List of Connections, etc. (North Metropolitan System) — Continued.*

DATE AUTHORIZED.	CITY OR TOWN.	LOCATION OF CONNECTION.	SIZE.	DATE OF COMPLETION.
Nov. 5, 1898,	Somerville,	On the estate of Levi Russell, near North Street, . . . . .	12 inch,	Dec. 17, 1898.
July 29, 1899,	Stoneham,	At the end of the metropolitan sewer in Franklin Street, near Melrose line, . . . . .	10 inch,	To be made.
June 22, 1895,	Winchester,	Corner Main and Church streets, . . . . .	10 inch,	Feb. 27, 1895.
June 22, 1895,	Winchester,	Common Street, . . . . .	10 inch,	Feb. 27, 1895.
June 22, 1895,	Winchester,	Rear of freight sheds, Boston & Maine Railroad, . . . . .	15 inch,	Mar. 21, 1895.
Jan. 26, 1895,	Winchester,	Near siphon at Mystic station at Abbajona River, . . . . .	10 inch,	July 21, 1895.
Jan. 26, 1895,	Winchester,	Old Mystic valley sewer, near Abbajona River, . . . . .	10 inch,	Aug. 8, 1895.
—	—	Turned the old Mystic valley sewer into the metropolitan sewer, . . . . .	—	July 18, 1895.
Oct. 3, 1896,	Winchester,	Easterly side of metropolitan sewer in Cross Street, . . . . .	12 inch,	Oct. 17, 1896.
Nov. 30, 1895,	Winchester,	275 feet south of Swanton Street, Station 5-11.20, Section 45,	15 inch,	Dec. 21, 1895.
Aug. 1, 1896,	Winchester,	On westerly side of metropolitan sewer in Mystic valley park-way, at man-hole, . . . . .	18 inch,	Aug. 25, 1896.
Nov. 20, 1897,	Winchester,	Beggs & Cobbs' currying establishment, . . . . .	6 inch,	Dec. 6, 1897.
Jan. 27, 1894,	Winthrop,	Shirley Street, corner Washington Avenue, . . . . .	12 inch,	Jan. 17, 1895.
July 6, 1895,	Winthrop,	Pleasant Street, near Belle Isle Inlet, . . . . .	12 inch,	Aug. 24, 1895.
Oct. 12, 1895,	Winthrop,	Shirley Street, Short Beach, . . . . .	10 inch,	Oct. 29, 1895.
July 22, 1896,	Winthrop,	At Magee's Corner, . . . . .	12 inch,	Oct. 8, 1896.
June 10, 1899,	Winthrop,	Taft Avenue, . . . . .	6 inch,	June 27, 1899.
May 25, 1895,	Woburn,	Corner Canal and Lake streets, . . . . .	15 inch,	Oct. 9, 1895.
Sept. 7, 1895,	Woburn,	In private land, Baeder, Adamson & Co., glue works settling tanks, . . . . .	8 inch,	Nov. 9, 1895.
July 6, 1895,	Woburn,	Old Mystic valley sewer, at Cross Street, . . . . .	15 inch,	Sept. 2, 1895.
July 18, 1895,	Woburn,	80 feet north of Cross Street, end of old Mystic valley sewer (temporary), . . . . .	15 inch,	July 18, 1895.

*Charles River System.*

May 3, 1892,	Boston,*	Cambridge Street, corner Seattle Street, . . . . .	15 inch,	May 8, 1892.
May 6, 1892,	Boston,*	Rena Street, . . . . .	12 inch,	May 6, 1892.

\* Brighton.

TABLE L.—*List of Connections, etc. (Charles River System) — Continued.*

DATE AUTHORIZED.	CITY OR TOWN.	LOCATION OF CONNECTION.	SIZE.	DATE OF COMPLETION.
Sept. 27, 1892,	Boston,*	Western Avenue, foot of Market Street, . . . . .	18 inch,	Sept. 27, 1892.
Oct. 28, 1892,	Boston,*	Western Avenue, near Everett Street, . . . . .	24 inch,	Oct. 28, 1892.
Jan. 27, 1893,	Boston,*	Near Salt Creek, . . . . .	24 inch,	Jan. 27, 1893.
May 2, 1893,	Boston,*	Near Parson's Brook, . . . . .	24 inch,	May 2, 1893.
July 1, 1893,	Boston,*	Near Faneuil station, . . . . .	16 inch,	July 1, 1893.
July 12, 1893,	Boston,*	Rena Street, corner Bertram Street, . . . . .	16 inch,	Aug. 25, 1893.
Aug. 19, 1893,	Boston,*	Abattoir, Station 24+08, . . . . .	16 inch,	Sept. 26, 1893.
Aug. 19, 1893,	Boston,*	Abattoir, Station 34+63, . . . . .	16 inch,	Oct. 6, 1893.
Sept. 9, 1893,	Boston,*	Abattoir (tripe works), . . . . .	16 inch,	Oct. 26, 1893.
May 12, 1894,	Boston,*	Parsons Street, opposite Taylor's Mill, . . . . .	24 inch,	July 31, 1894.
Nov. 17, 1894,	Boston,*	Corner North Harvard and Spurr streets, . . . . .	16 inch,	Nov. 20, 1894.
May 24, 1892,	Boston, .	Brookline Avenue, corner Bellevue Street, . . . . .	12 inch,	May 24, 1892.
May 30, 1892,	Boston, .	133 feet north of Brookline Avenue, Back Bay Fens, . . . . .	6 inch,	May 12, 1893.
May 19, 1894,	Boston, .	Huntington Avenue, near Parker Street, . . . . .	12 inch,	May 30, 1894.
Oct. 13, 1892,	Boston, .	Commonwealth Avenue and St. Mary Street, . . . . .	18 inch,	Oct. 13, 1892.
Feb. 8, 1893,	Boston, .	Vila Street, . . . . .	24 inch,	Feb. 8, 1893.
May 12, 1893,	Boston, .	Park Commissioners, Administration Building, . . . . .	6 inch,	May 12, 1893.
May 19, 1894,	Boston, .	Huntington Avenue and Parker Street, . . . . .	12 inch,	May 30, 1894.
July 20, 1895,	Boston, .	Corner Huntington Avenue and Bryant Street, on south side of metropolitan sewer, . . . . .	24 inch,	Sept. 10, 1895.
July 20, 1895,	Boston, .	Corner Huntington Avenue and Bryant Street, on north side of metropolitan sewer, . . . . .	12 inch,	Sept. 26, 1895.
April 29, 1892,	Brookline,	Commonwealth Avenue, corner St. Mary Street, . . . . .	24 inch,	Apr. 29, 1892.
May 8, 1892,	Newton,	At Lemon or Hyde Brook, . . . . .	24 inch,	May 3, 1892.
May 4, 1892,	Newton,	California Street, corner Crescent Street, . . . . .	24 inch,	May 4, 1892.
May 28, 1892,	Newton,	Nonantum Street, . . . . .	10 inch,	May 28, 1892.
Oct. 8, 1892,	Newton,	Near Cheesecake Brook, . . . . .	24×36 in.	Oct. 8, 1892.
May 11, 1893,	Newton,	California and Said streets, . . . . .	10 inch,	May 11, 1893.
Sept. 1, 1893,	Newton,	California and Dalby streets, . . . . .	10 inch,	Sept. 1, 1893.

\* Brighton.

TABLE L.—*List of Connections, etc. (Charles River System) — Continued.*

DATE AUTHORIZED.	CITY OR TOWN.	LOCATION OF CONNECTION.	SIZE.	DATE OF COMPLETION.
Oct. 26, 1895.	Newton,	In garden of Sarah L. M. Bates, near Hyde Brook, . . . . .	5 inch,	Nov. 4, 1895.
May 2, 1896.	Newton,	In land of estate of Matilda Emerson, east of Hyde Brook, . . . . .	5 inch,	May 18, 1896.
June 24, 1892.	Waltham,	Corner North and Calvary streets, at the end of the metropolitan sewer, . . . . .	—	June 24, 1892.
June 9, 1892.	Watertown,	California Street, corner Galen Street, . . . . .	24 inch,	June 9, 1892.
July 9, 1892.	Watertown,	Watertown Street, corner California Street, . . . . .	10 inch,	July 9, 1892.
July 9, 1892.	Watertown,	Water Street, on the east side of the metropolitan sewer, . . . . .	8 inch,	July 9, 1892.
July 9, 1892.	Watertown,	Water Street, on the west side of the metropolitan sewer, . . . . .	8 inch,	July 9, 1892.
May 26, 1898.	Watertown,	Barker's Starch Factory, . . . . .	6 inch,	May 26, 1898.
July 1, 1898.	Watertown,	Hickory Wheel Company, . . . . .	5 inch,	Never connected.
June 26, 1897.	Watertown,	At siphon at U. S. Arsenal, . . . . .	18 inch,	July 21, 1897.
Sept. 16, 1899.	Watertown,	Locomobile Company near Water Street, . . . . .	6 inch,	To be made.

*Neponset Valley System.*

July 10, 1897.	Boston,*	River Street, near Fremont Street,	15 inch,	July 13, 1897.
Sept. 3, 1898.	Boston,†	Near Spring Street (Parental School), . . . . .	12 inch,	Aug. 14, 1898.
Sept. 3, 1898.	Boston,†	Weld and LaGrange streets, . . . . .	12 inch,	Sept. 15, 1898.
May 14, 1898.	Boston,*	Near Idaho Street, . . . . .	12 inch,	Nov. 13, 1898.
May 21, 1898.	Boston,*	Adams and Butler streets, . . . . .	12 inch,	July 18, 1898.
July 30, 1898.	Boston,*	Adams Street, near junction of Shawmut Branch and Old Neponset road, . . . . .	15 inch,	Oct. 14, 1898.
July 10, 1897.	Boston,*	River Street, near Fremont Street,†	15 inch,	July 13, 1897.
Dec. 8, 1898.	Boston,*	Hunton Street, . . . . .	12 inch,	Dec. 23, 1898.
Jan. 7, 1899.	Boston,†	Weld Street, at man-hole at end of metropolitan sewer, . . . . .	12 inch,	Jan. 7, 1899.
Sept. 2, 1899.	Boston,*	Proposed extension Blue Hill Avenue at Mattapan Square, . . . . .	18 inch,	To be made.
July 8, 1897.	Hyde Park,	Fairmount Avenue, between New England Railroad and Neponset River, . . . . .	12 inch,	Aug. 6, 1897.
July 8, 1897.	Hyde Park,	Opposite extension of Milton Avenue, foot of Walter Street, . . . . .	18 inch,	Oct. 14, 1897.
July 8, 1897.	Hyde Park,	Arlington Street, corner Metropolitan Avenue, . . . . .	15 inch,	Aug. 6, 1897.

\* Dorchester.

† West Roxbury.

TABLE L.—*List of Connections, etc. (Neponset Valley System) — Concluded.*

DATE AUTHORIZED.	CITY OR TOWN.	LOCATION OF CONNECTION.	SIZE.	DATE OF COMPLETION.
July 8, 1897,	Hyde Park, .	Hyde Park Avenue, near Factory Street, . . . . .	12 inch,	July 14, 1897.
July 10, 1897,	Hyde Park, .	Hyde Park Avenue, near Factory Street, . . . . .	20 inch,	Aug. 11, 1899.
Aug. 11, 1897,	Hyde Park, .	Corner Business Street and Barry Place, . . . . .	16 inch,	Sept. 7, 1897.
Oct. 9, 1897,	Hyde Park, .	Business Street, at Glenwood Street, . . . . .	12 inch,	Sept. 27, 1898.
July 23, 1898,	Hyde Park, .	Walnut Street near New England Railroad, . . . . .	8 inch,	Sept. 9, 1898.
May 6, 1899,	Hyde Park, .	West River Street, . . . . .	8 inch,	June 16, 1899.
June 8, 1899,	Hyde Park, .	Sally Sumner estate, . . . . .	12 inch,	Aug. 30, 1899.
Sept. 4, 1897,	Milton, . .	Blue Hills Parkway, . . . . .	12 inch,	Nov. 16, 1897.
Nov. 20, 1897,	Milton, . .	Adams Street, . . . . .	8 inch,	Nov. 30, 1897.
July 23, 1898,	Milton, . .	At Central Avenue, . . . . .	15 inch,	Aug. 22, 1898.

TABLE M.—ASSETS AND LIABILITIES, SEPT. 30, 1899.

*Assets.*

Office furniture, fittings and supplies, including fittings for field offices, stationery, etc., . . . . .	\$3,793 82
Engineers' instruments and supplies, including railroad tickets, . . . . .	3,780 01
Engines, pumps, boilers, derricks, inclines, buckets, row boats, dump cars and heavy appliances, . . . . .	5,080 65
Pumping station fixtures, tools and supplies, . . . . .	9,182 14
Miscellaneous tools, . . . . .	618 65
Miscellaneous supplies, . . . . .	1,180 23
Engineers' field offices, sheds, barns, tool houses, carts, express wagon, horse and harnesses, . . . . .	1,915 00
Stock yard and building, East Boston, . . . . .	2,500 00
Land for stock yard, Hyde Park, . . . . .	167 00
Vacant lots, Chelsea, . . . . .	1,300 00
Vacant lots, Winthrop, . . . . .	1,800 00
	\$31,817 50

There are numerous necessary plans, drawings, calculations and studies relating to the work, to which no stated value can be assigned; also about seventy miles of completed sewer, with pumping stations, siphons and other accessories necessary for operating the systems.

*Liabilities.*

Amounts due contractors on estimates, . . . . .	\$1,105 40
Amount unpaid on estimated land damages, including amounts barred by the statute of limitations, . . . . .	10,785 20
Fraction of pay rolls (laborers), . . . . .	604 47
Fraction of pay rolls (engineers), . . . . .	1,156 80
Commissioners', chief engineer's and clerical pay rolls, . . .	1,440 01
Unpaid bills,— miscellaneous (see pages 46-53), . . .	3,440 89
	<hr/>
	•18,532 77

There are also amounts due on pumping plant contracts which will be paid on succeeding estimates. Also there are cases pending in court. Such sums as may become due and payable on account of these cannot now be determined with any accuracy (see page 53).

